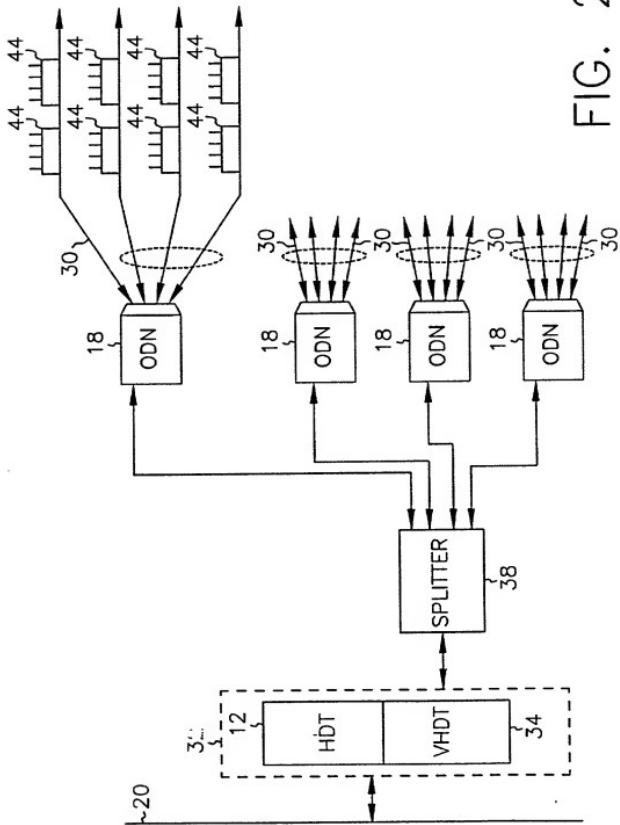


FIG. 1



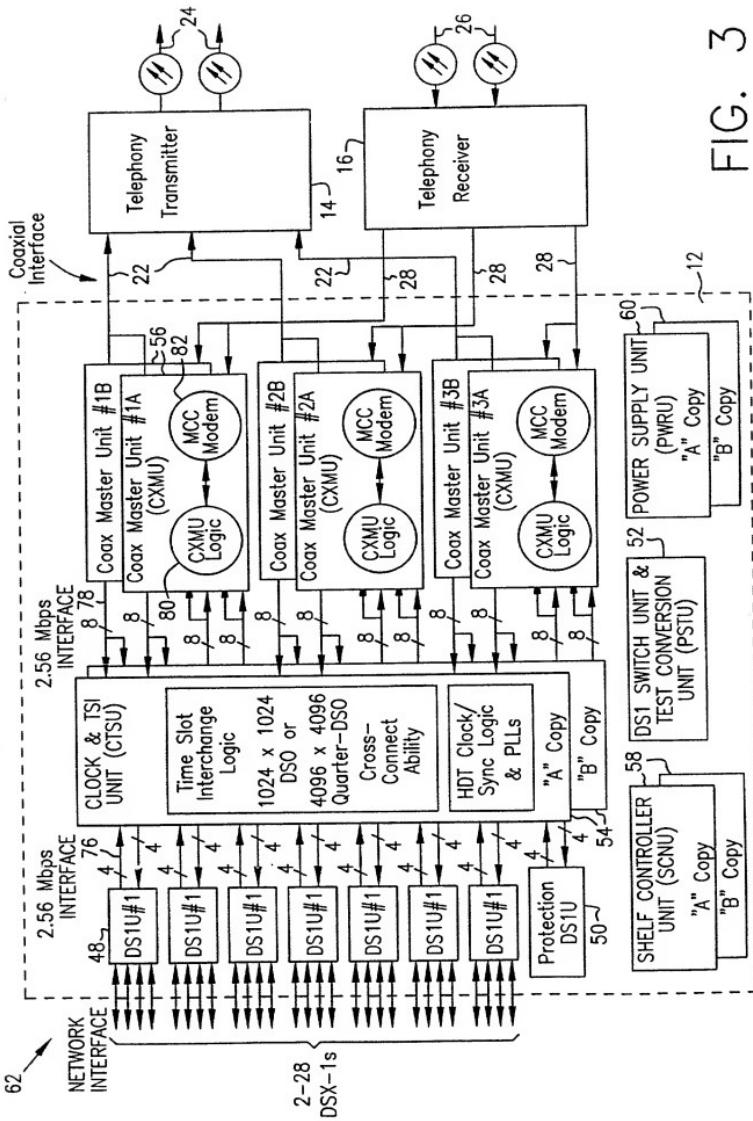


FIG. 3

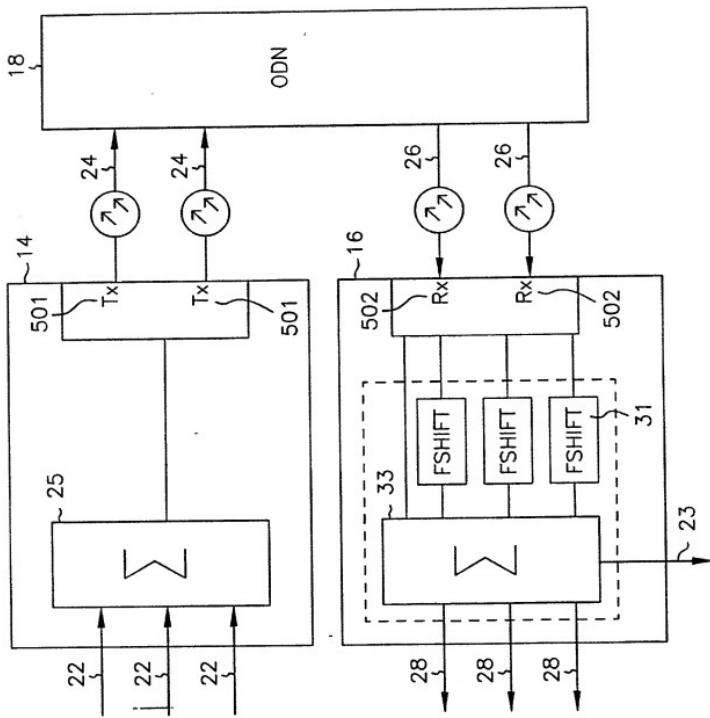


FIG. 4

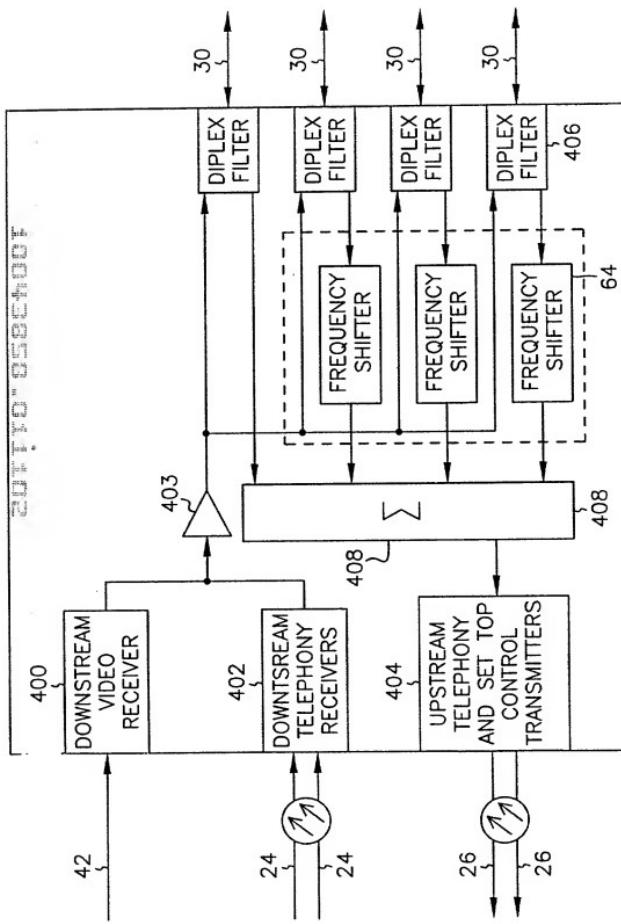


FIG. 5

FIG. 9

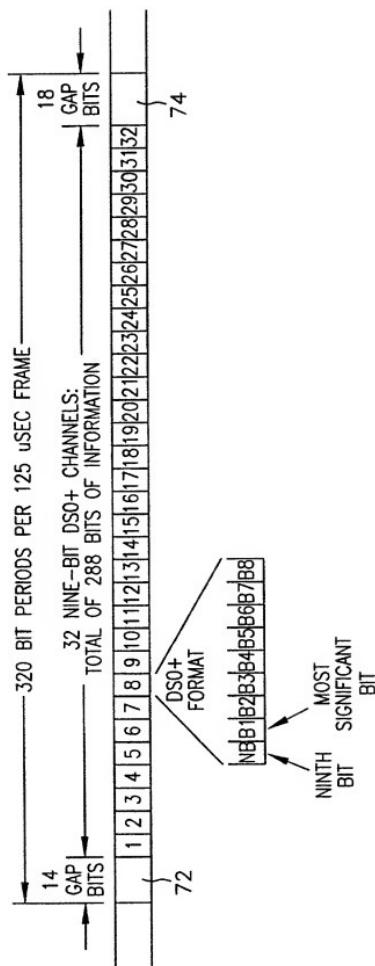
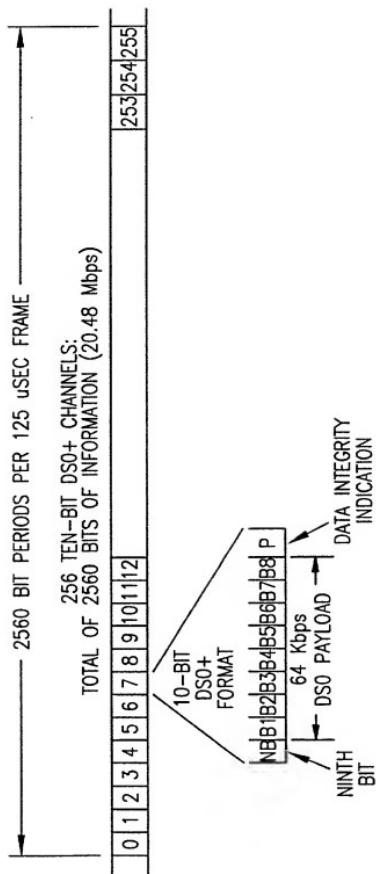


FIG. 10



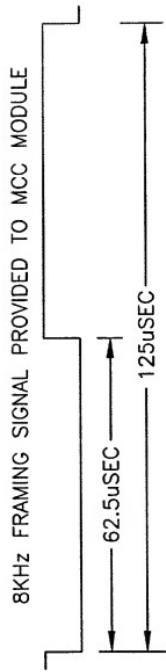


FIG. 11

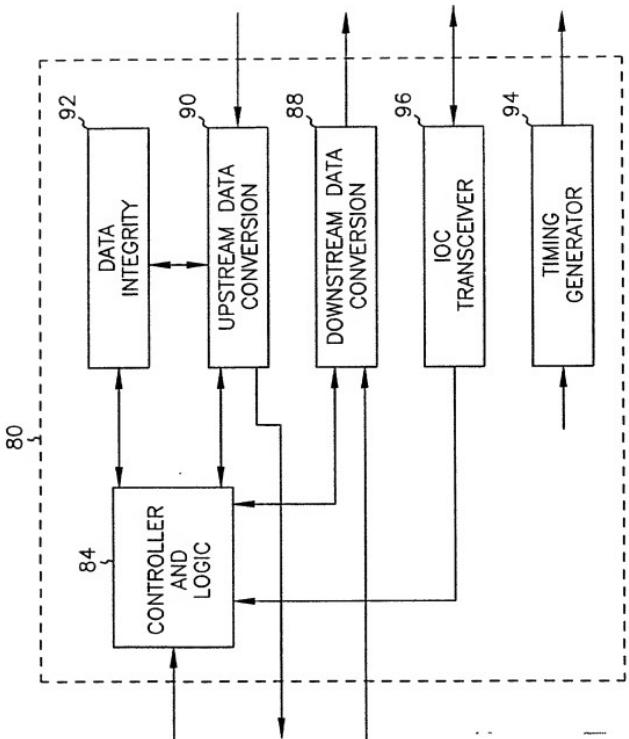


FIG. 12

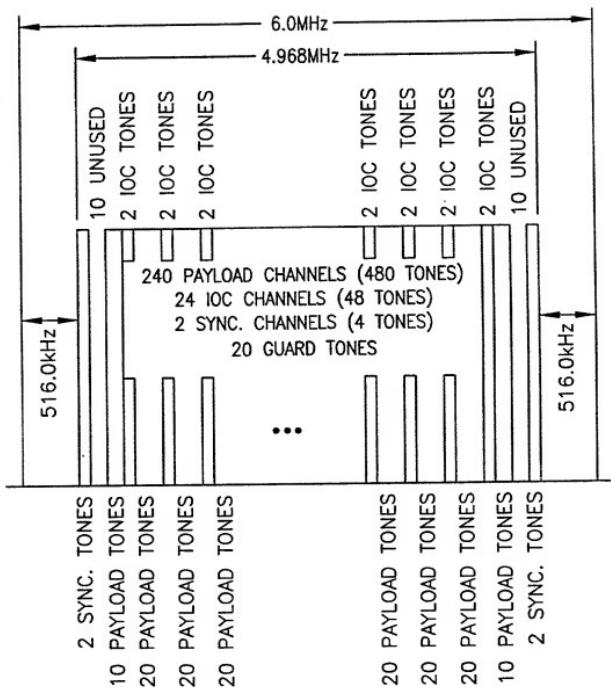


FIG. 13

○ USED IN RECEIVE ONLY   • TRANSMIT POINTS

	-5 (1011)	-3 (1101)	-1 (1111)	1 (0001)	3 (0011)	5 (0101)
QUADRATURE VALUE	10000 ○ 16	10000 • 16	10001 • 17	10011 • 19	10010 • 18	10010 ○ 18
	10100 • 20	11000 • 24	11001 • 25	11011 • 27	11010 • 26	11111 • 31
1 (0001)	11100 • 28	01000 • 8	01001 • 9	01011 • 11	01010 • 10	11110 • 30
-1 (1111)	11101 • 29	01100 • 12	01101 • 13	01111 • 15	01110 • 14	10110 • 22
-3 (1101)	10101 • 21	00100 • 4	00101 • 5	00111 • 7	00110 • 6	10111 • 23
-5 (1011)	00000 ○ 0	00000 • 0	00001 • 1	00011 • 3	00010 • 2	00010 ○ 2
	-5 (1011)	-3 (1101)	-1 (1111)	1 (0001)	3 (0011)	5 (0101)
INPHASE VALUE						

FIG. 14

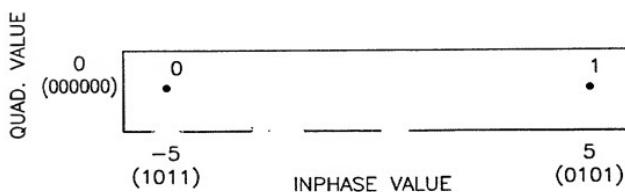
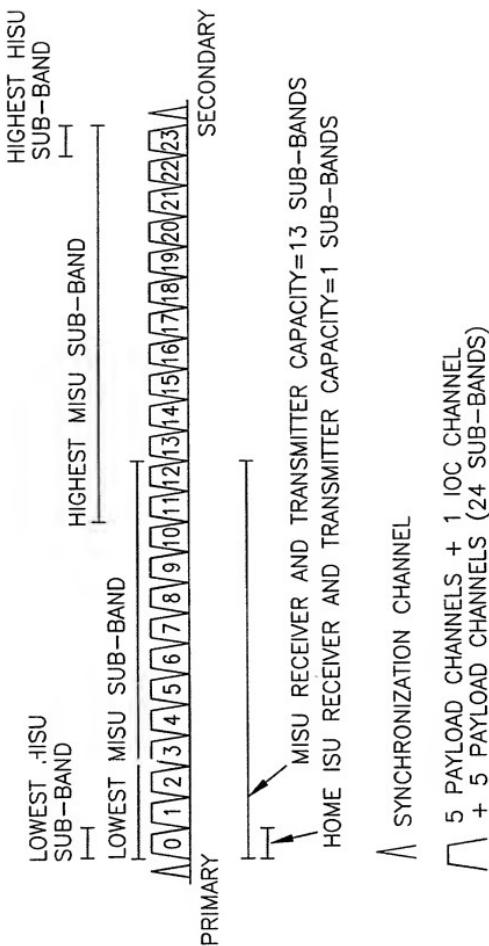


FIG. 15

FIG. 16



QUADRATURE ("Q") VALUE.

	5-BIT BINARY VALUE						DECIMAL VALUE
	10100 20	10100 21	10101 21	10001 17	10000 16	10000 16	10000 16
Q=110	10110 22	00100 4	00101 5	00001 1	00000 0	00010 •	10010 •
Q=101	10111 23	00110 6	00111 7	00011 3	00010 2	00010 •	10011 •
Q=100	11111 31	01110 14	01111 15	01011 11	01010 10	01010 •	11011 •
Q=011	11110 30	01100 12	01101 13	01001 9	01000 8	01000 •	11010 •
Q=010	11100 28	11100 28	11101 29	11001 25	11000 24	11000 •	11000 •
Q=001							

IN-PHASE ("I") VALUE

FIG. 17

QUADRATURE ("Q") VALUE ↑

5-BIT BINARY VALUE						DECIMAL VALUE
10100 ° 20	10100 • 21	10101 • 21	10001 • 17	10000 ° 16	10000 • 16	
10110 • 22	00100 • 4	00101 • 5	00001 • 1	00000 • 0	10010 • 18	
10111 • 23	00110 • 6	00111 • 7	00011 • 3	00010 • 2	10011 • 19	
11111 • 31	01110 • 14	01111 • 15	01011 • 11	01010 • 10	11011 • 27	
11110 • 30	01100 • 12	01101 • 13	01001 • 9	01000 • 8	11010 • 26	
11100 ° 28	11100 • 28	11101 • 29	11001 • 25	11000 • 24	11000 ° 24	

↓ I=001 I=010 I=011 I=100 I=101 I=110 IN-PHASE ("I") VALUE

FIG. 18

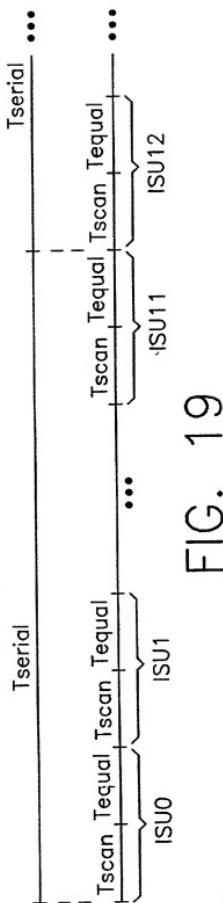


FIG. 19

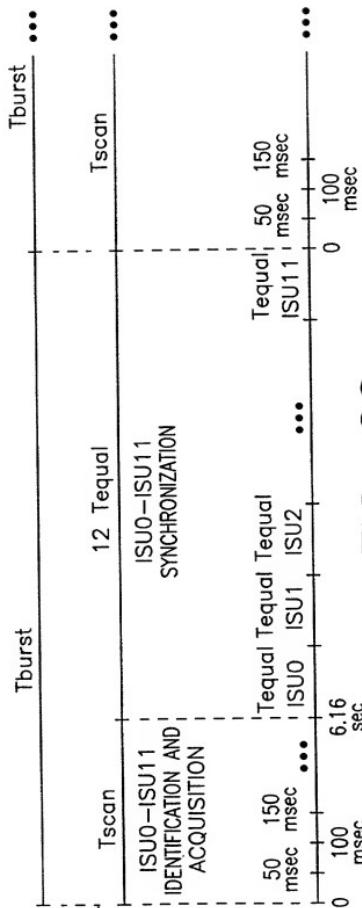


FIG. 20

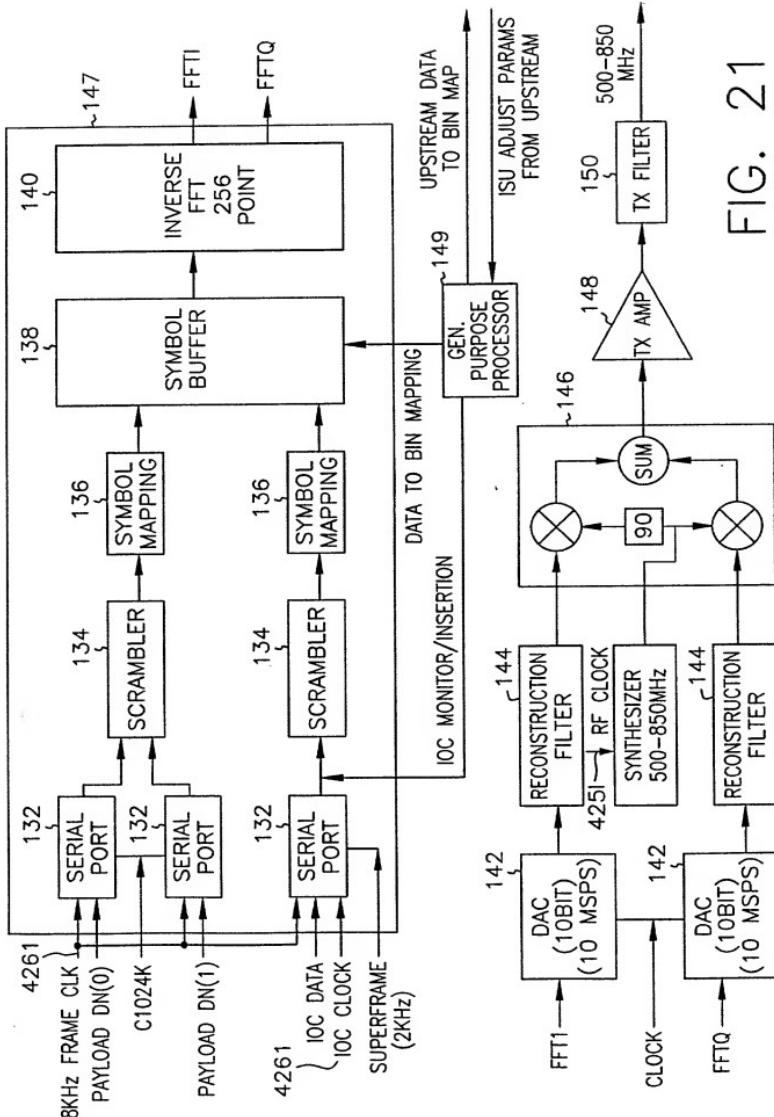


FIG. 21

FIG. 22

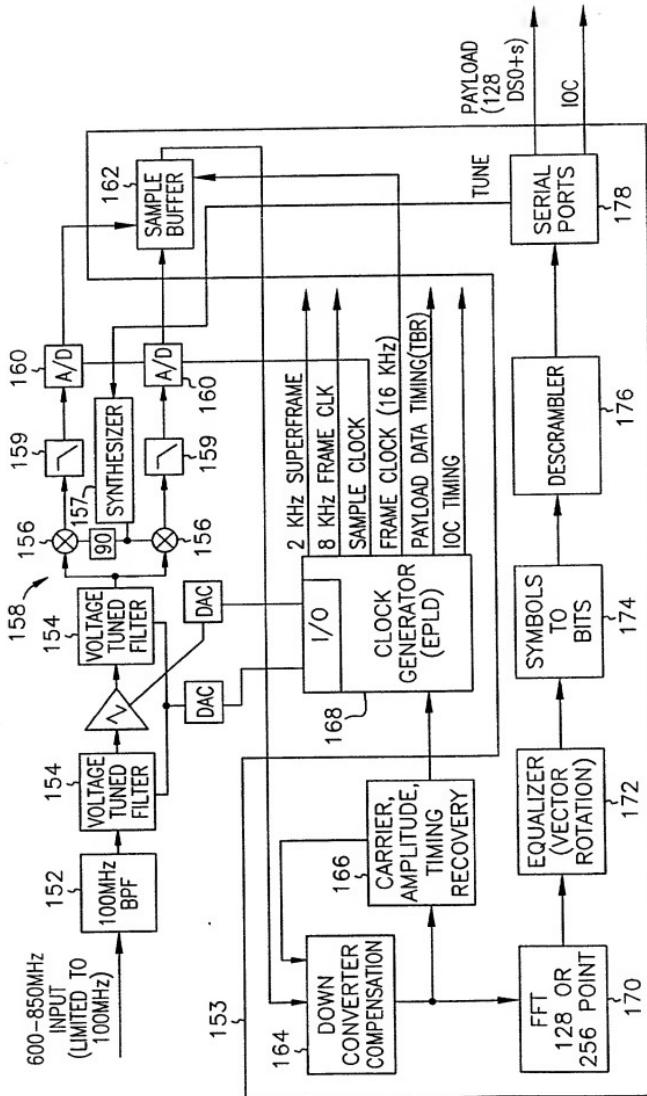
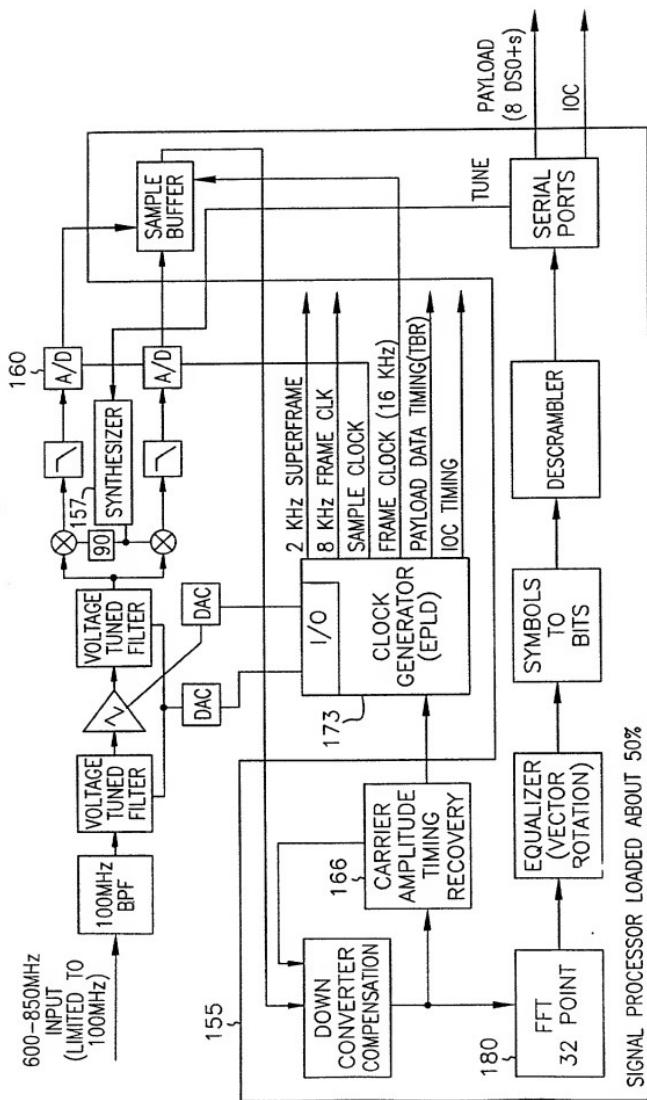


FIG. 23



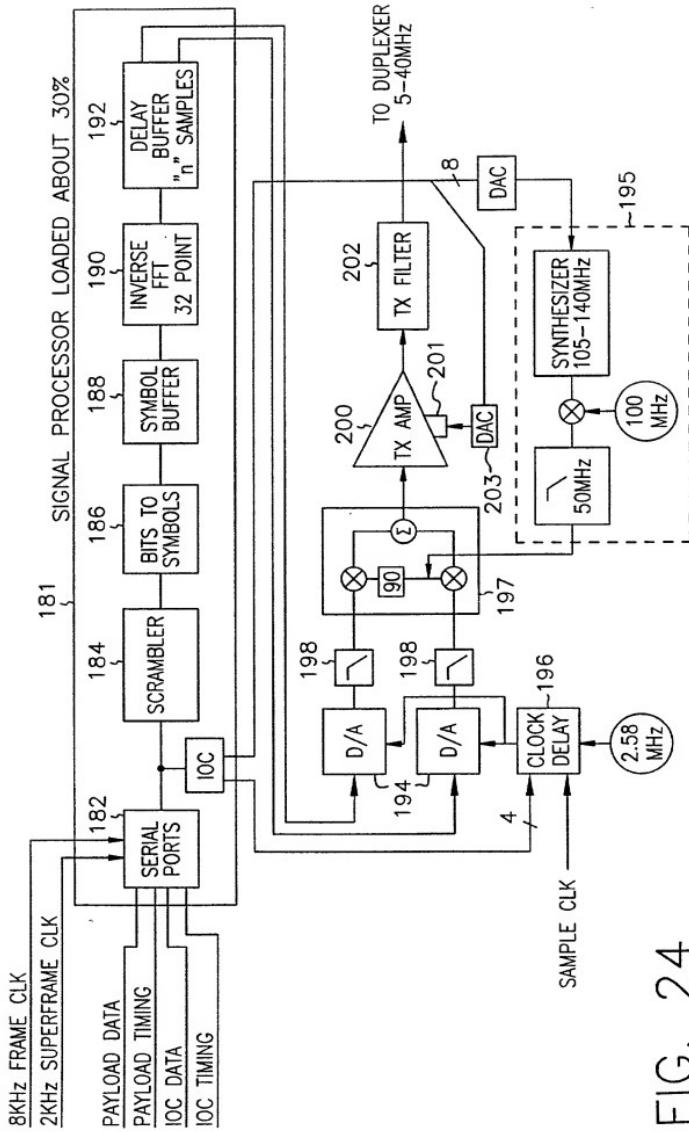


FIG. 24

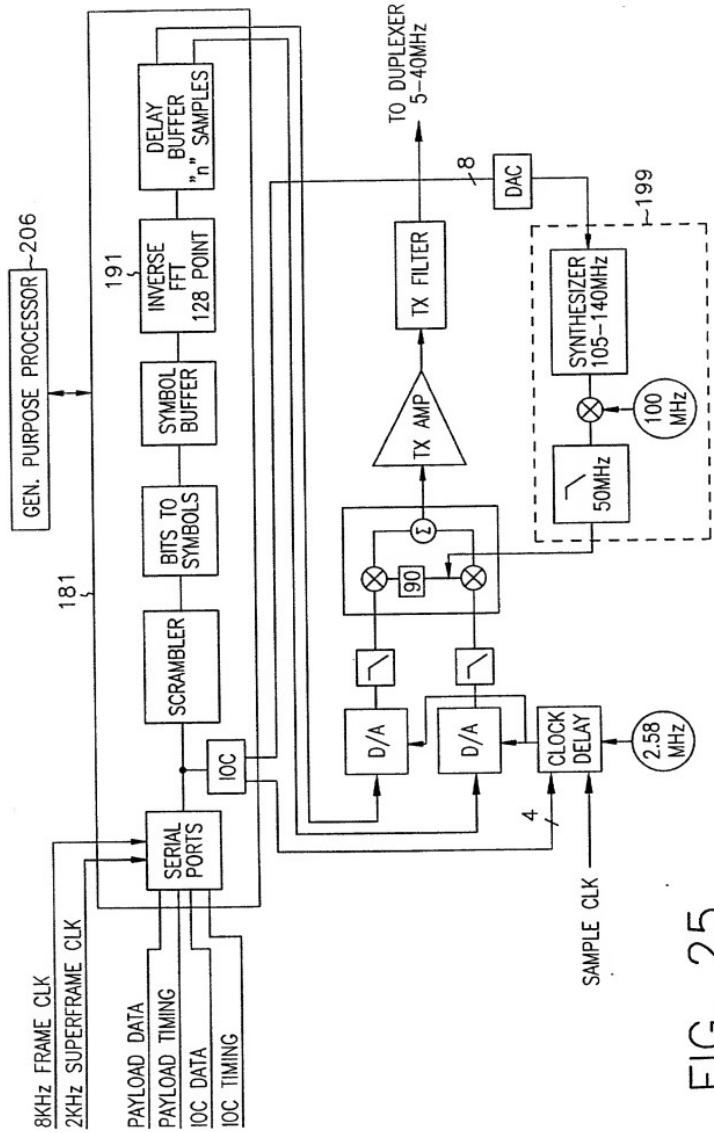
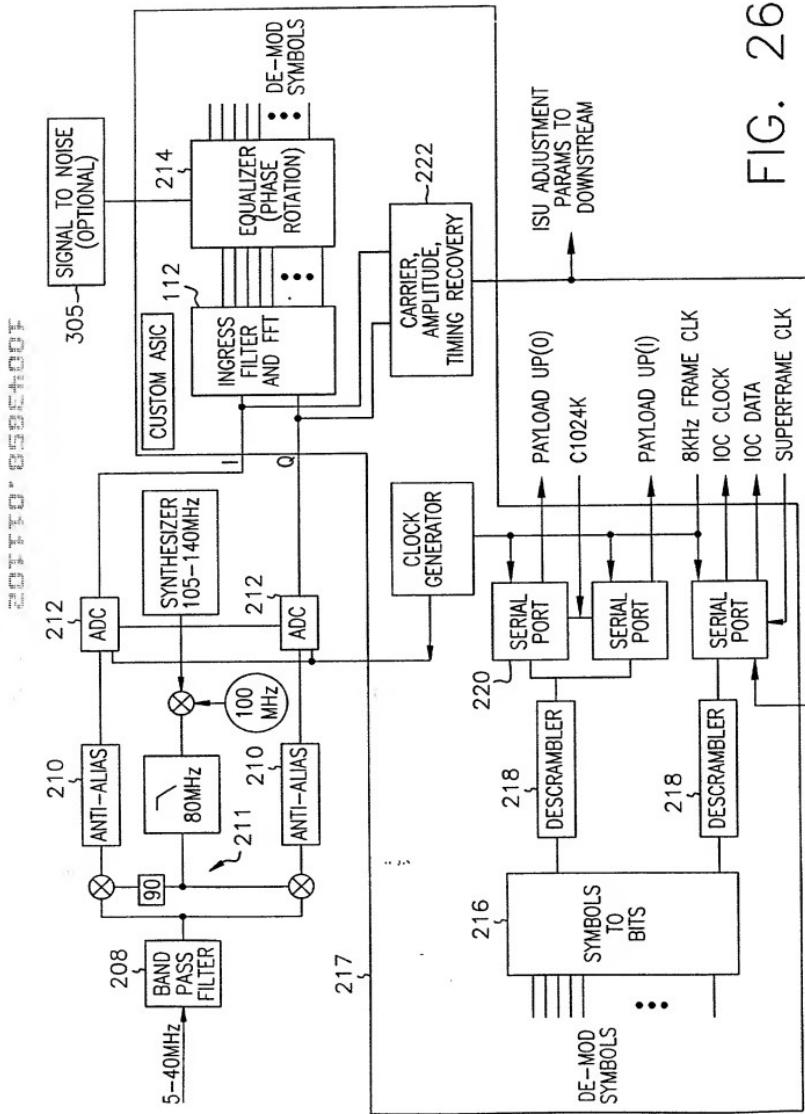


FIG. 25

FIG. 26



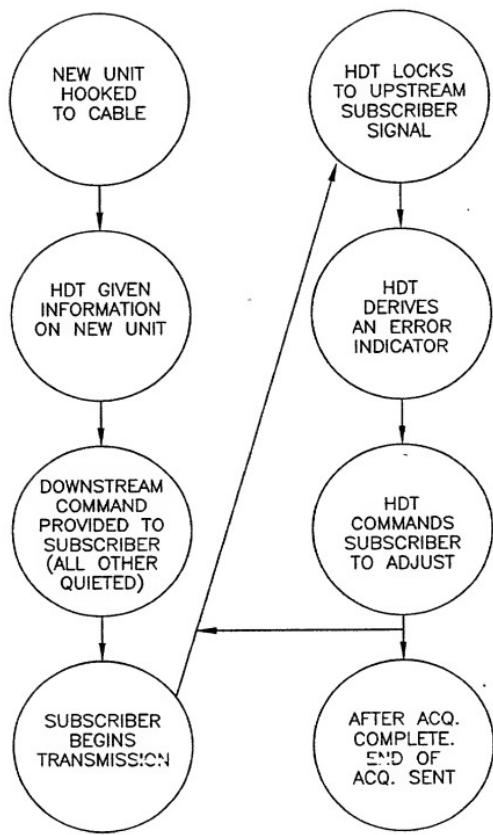


FIG. 27

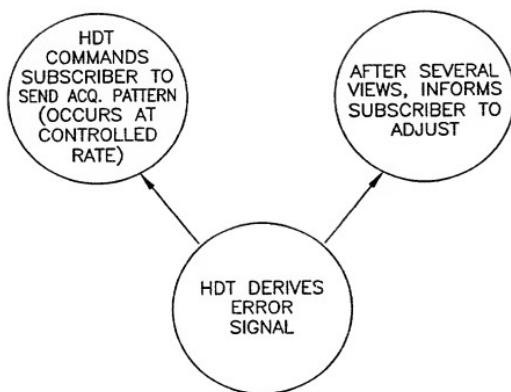


FIG. 28

Magnitude response of a single polyphase filter bank

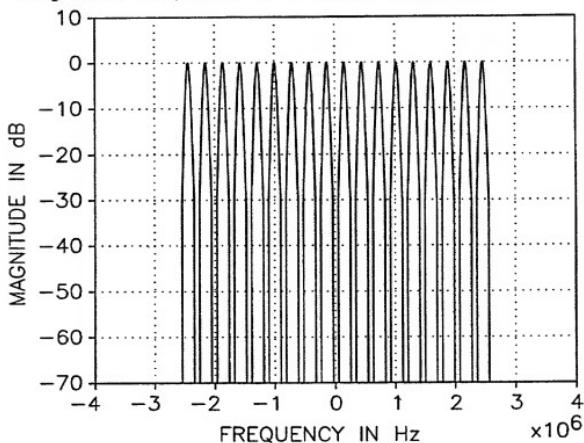


FIG. 29

Magnitude response of a single polyphase filter bank

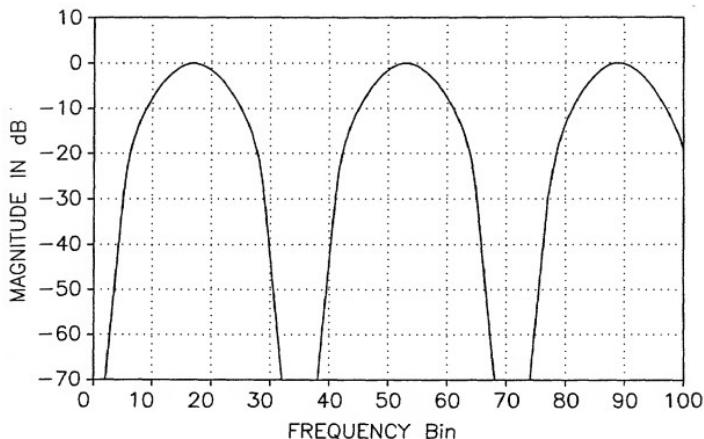


FIG. 30

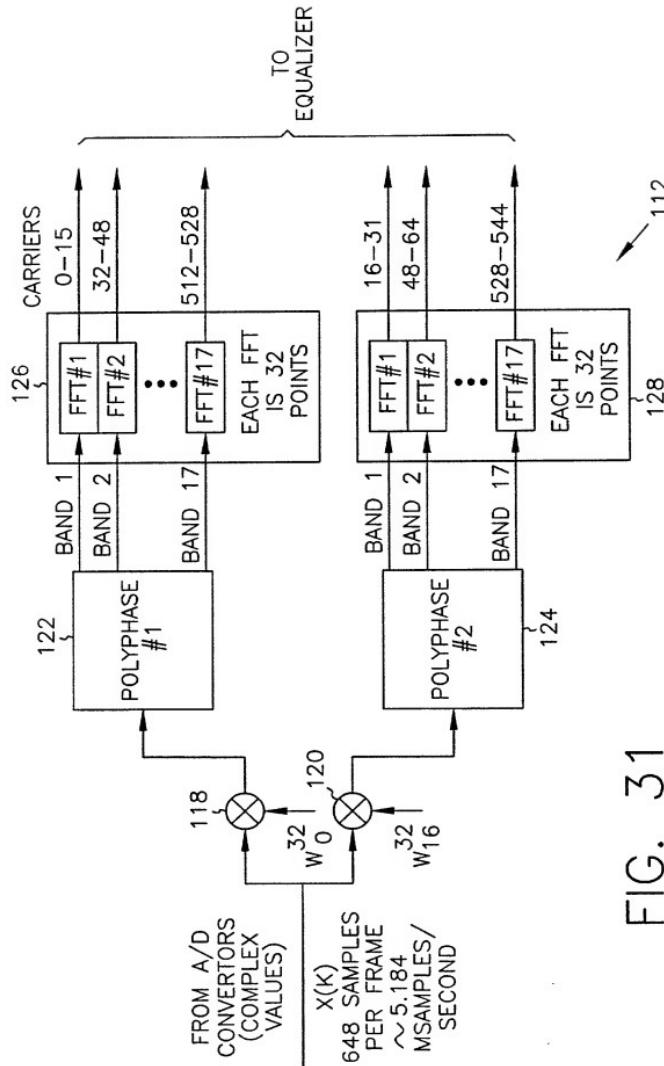


FIG. 31

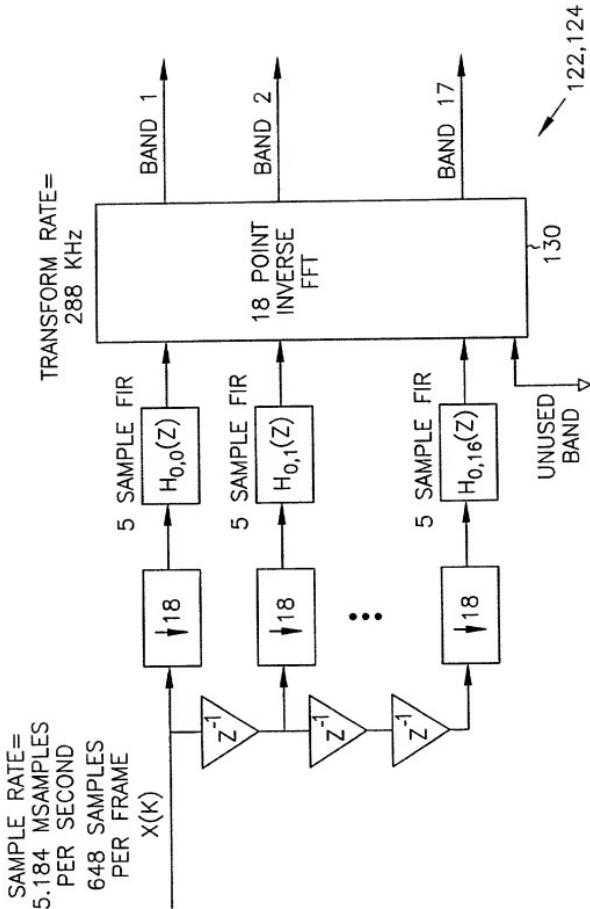


FIG. 32

FIG. 33

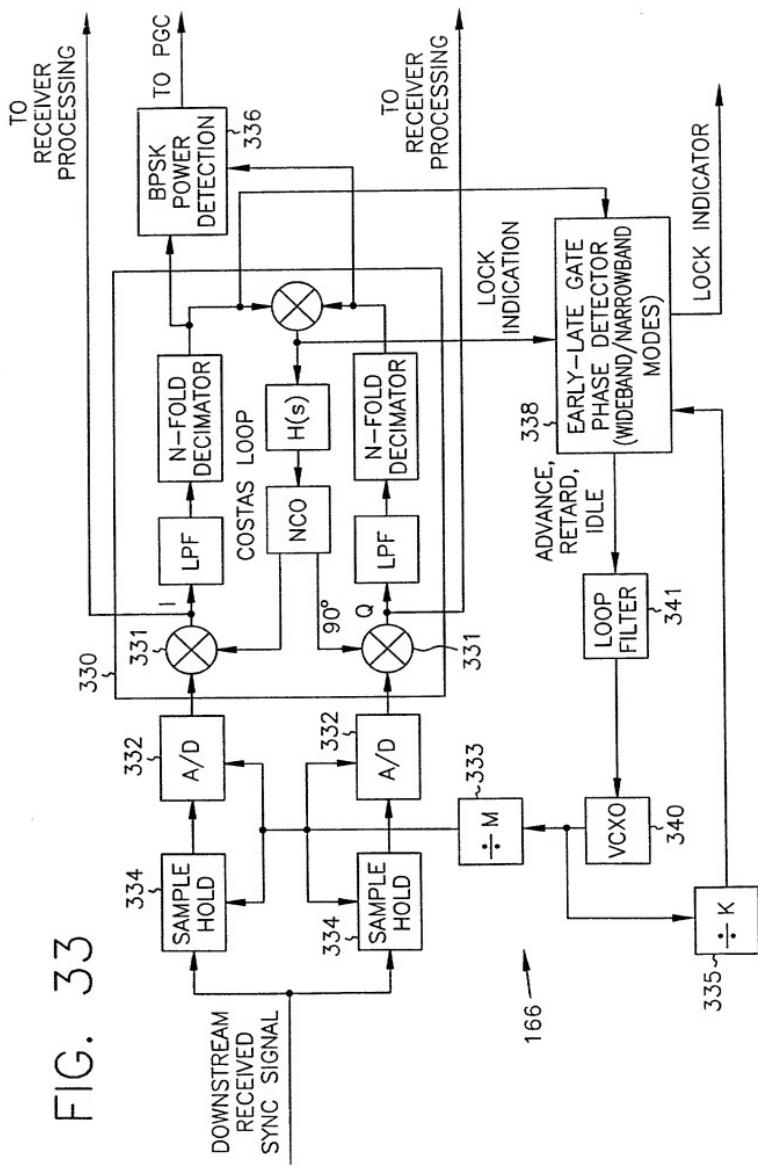
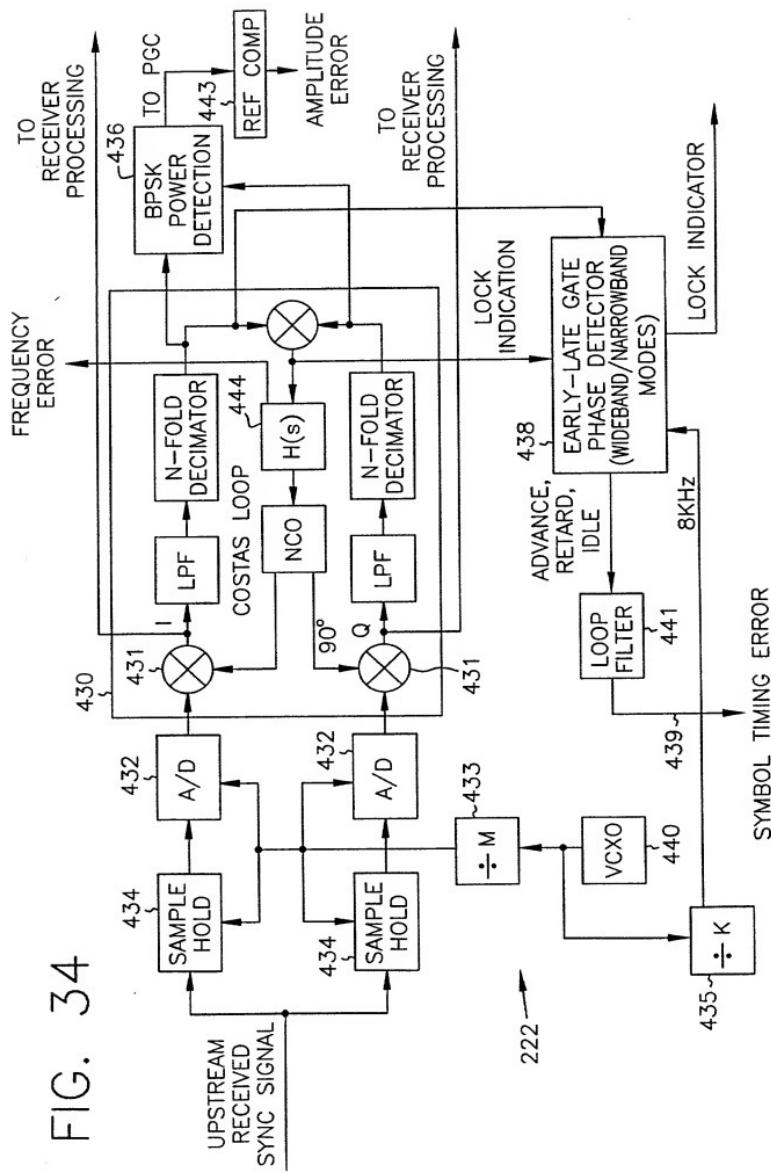


FIG. 34



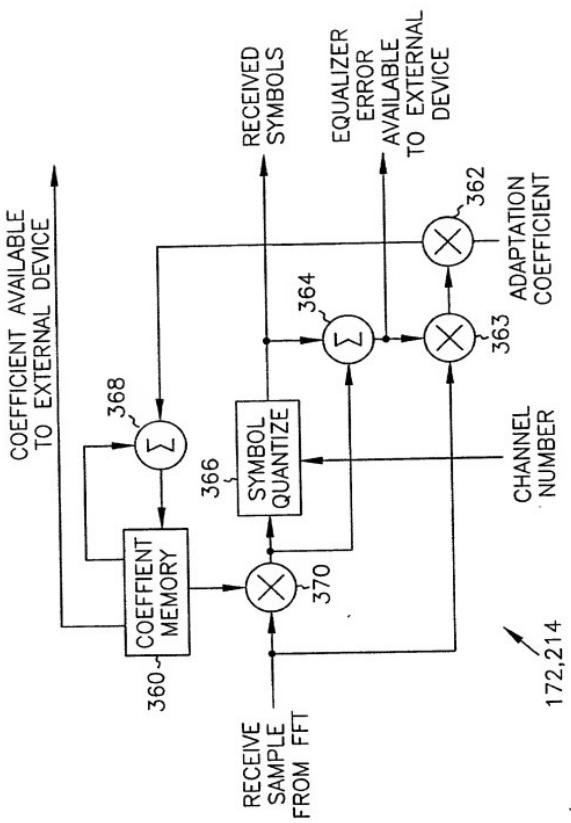


FIG. 35

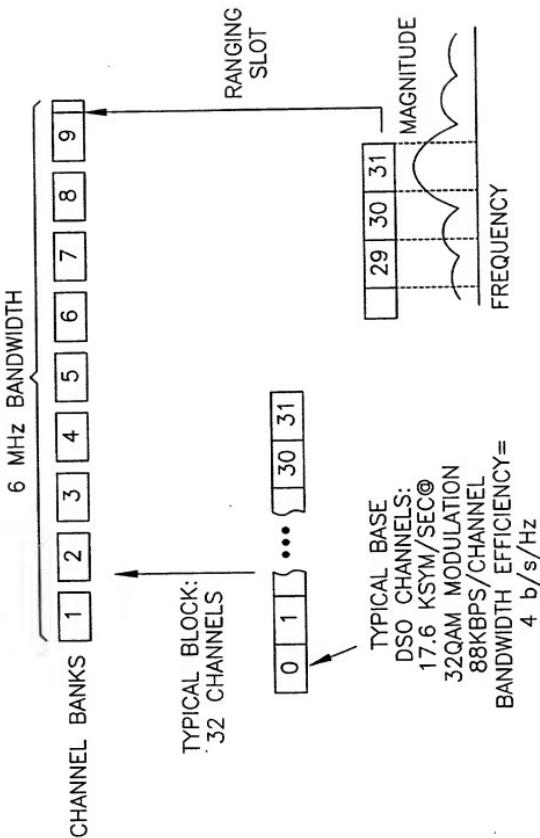


FIG. 36

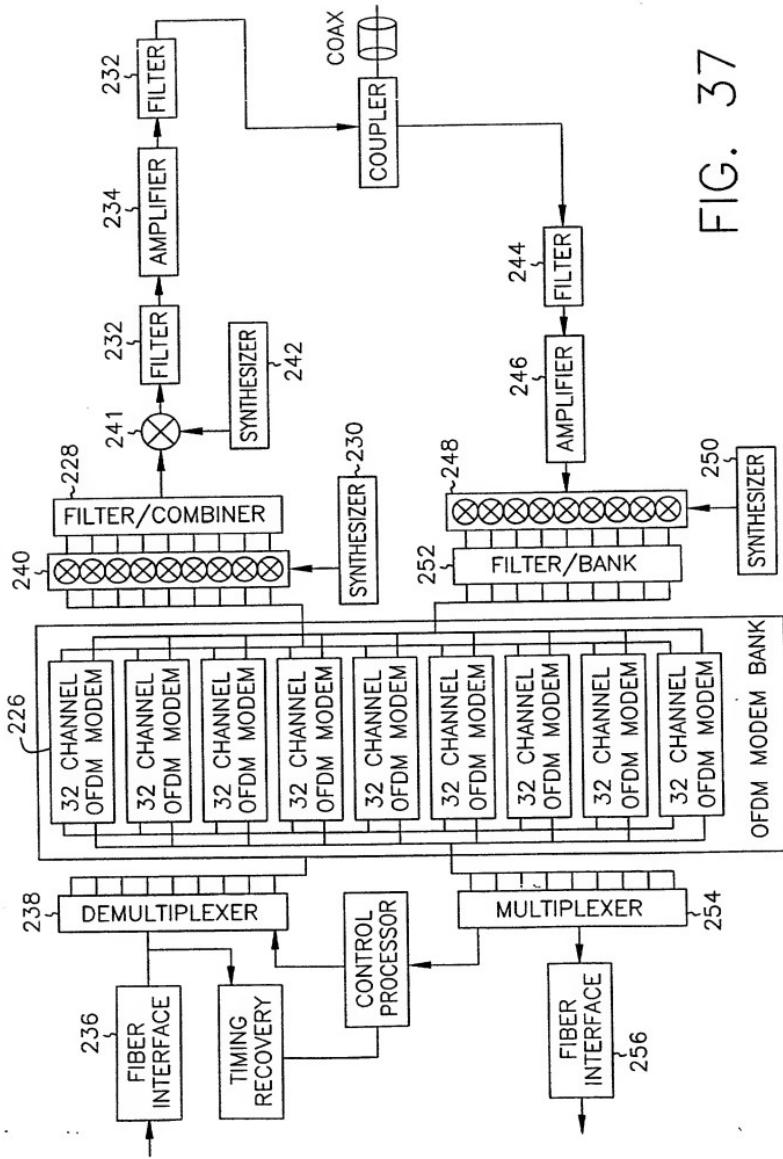


FIG. 37

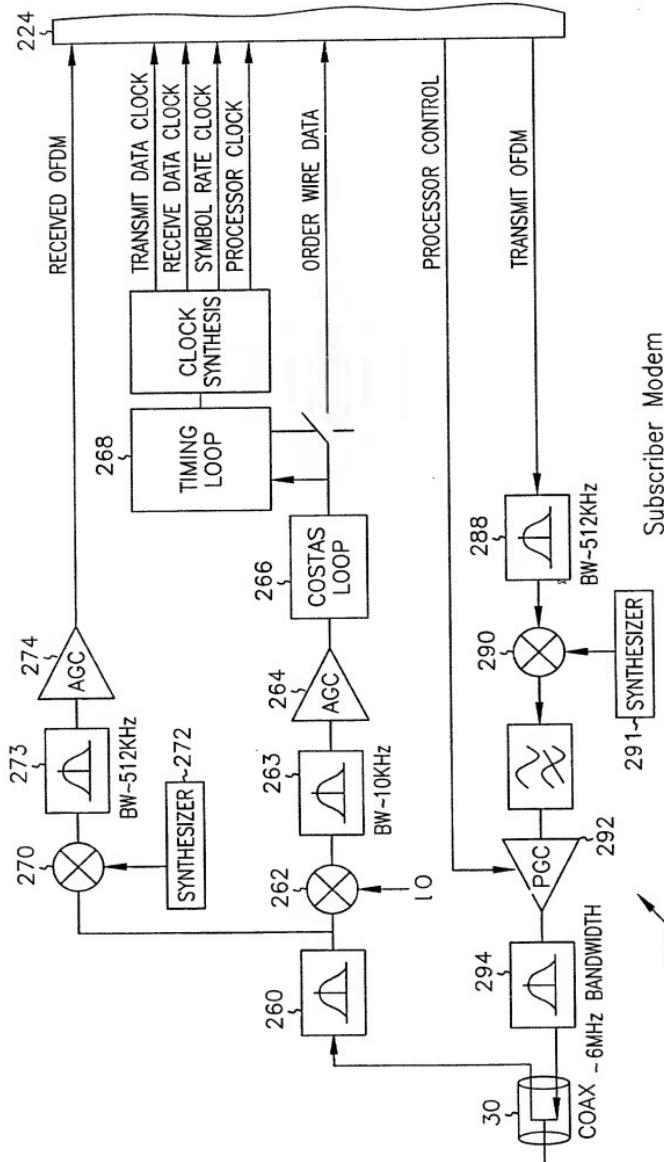


FIG. 38

## 32 CHANNEL OFDM MODEM

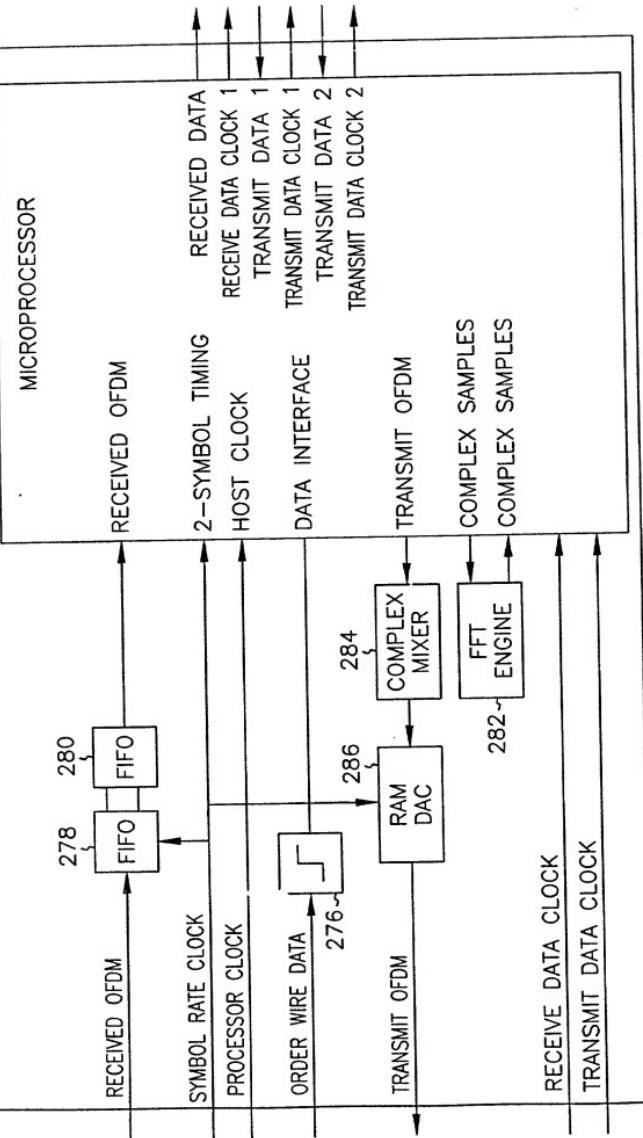


FIG. 39

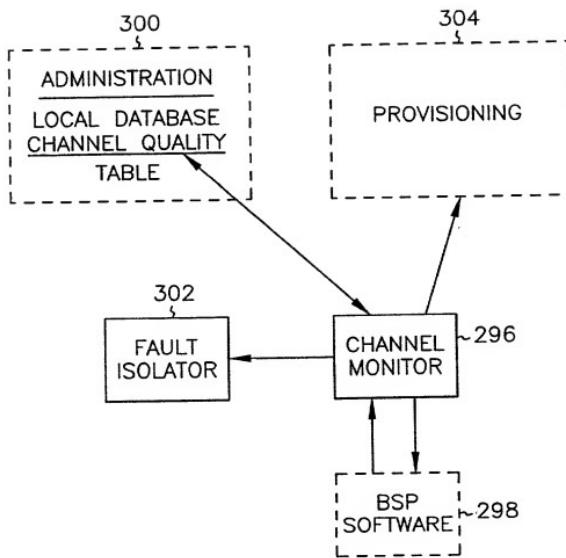


FIG. 40

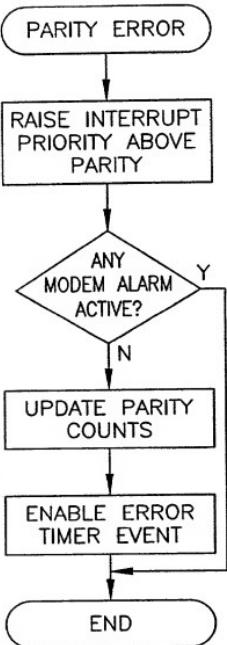


FIG. 41

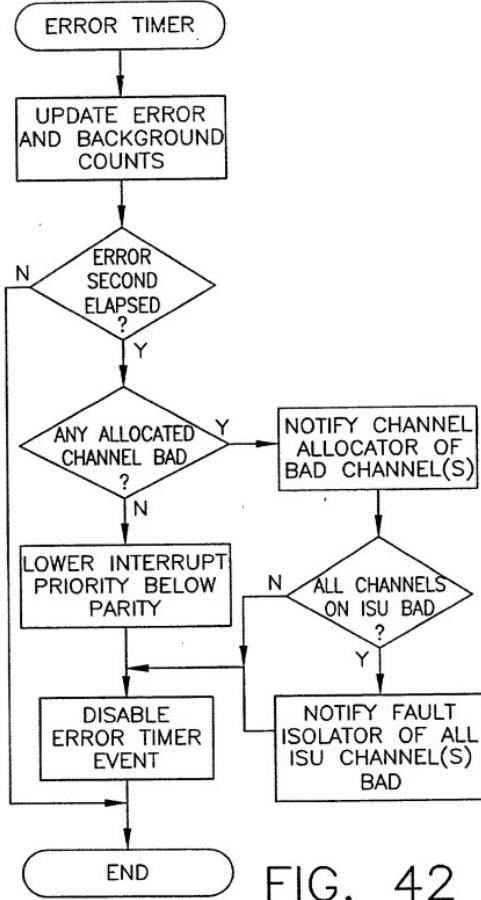


FIG. 42

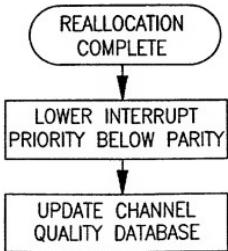
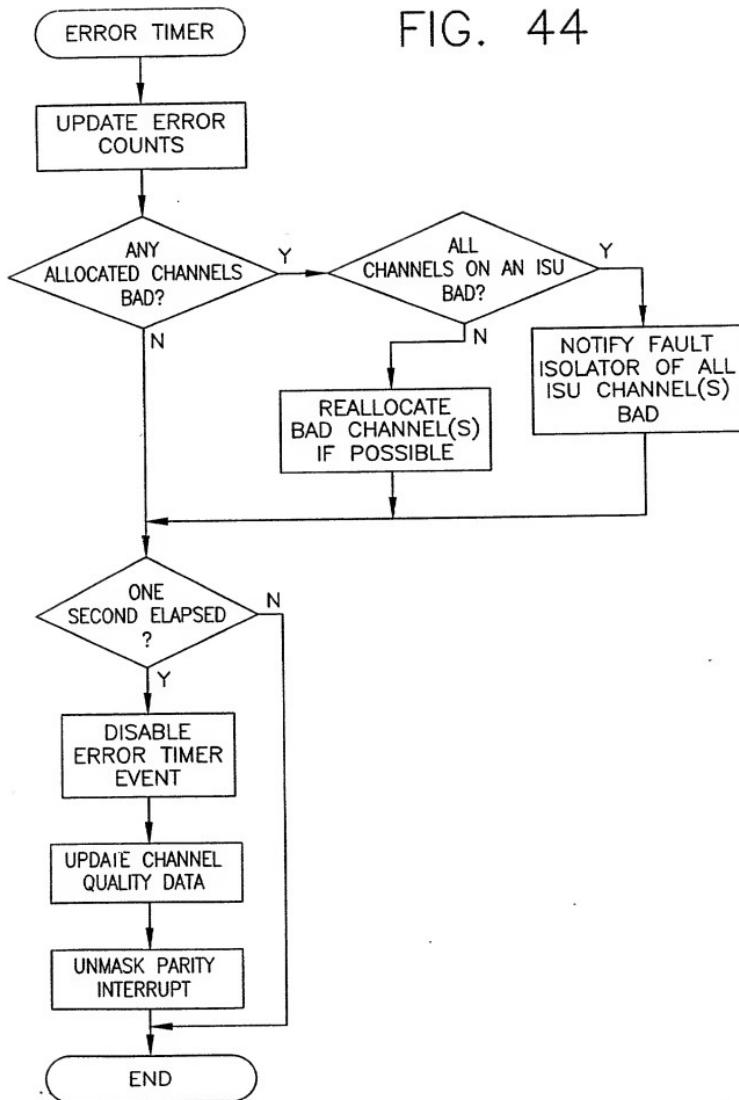


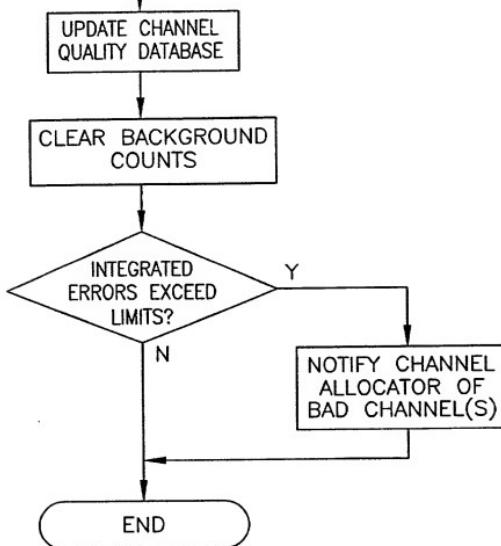
FIG. 43

FIG. 44



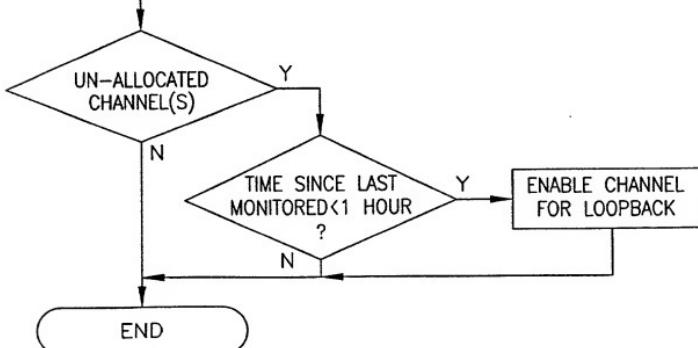
BACKGROUND TIMER

FIG. 45



BACKGROUND TIMER

FIG. 46



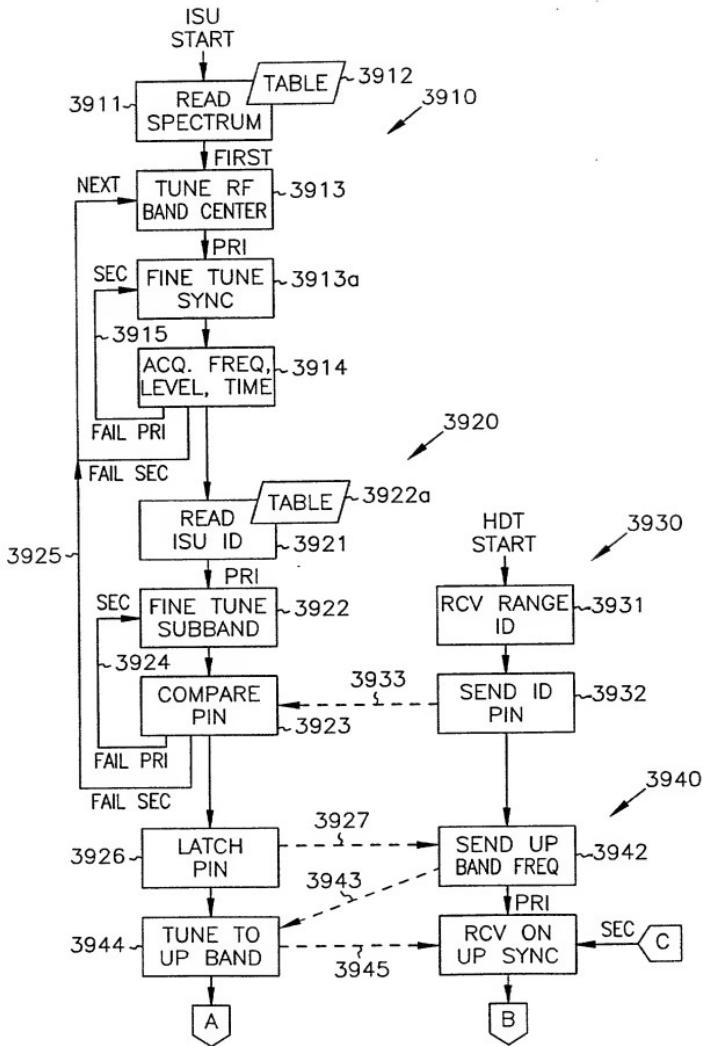


FIG. 47

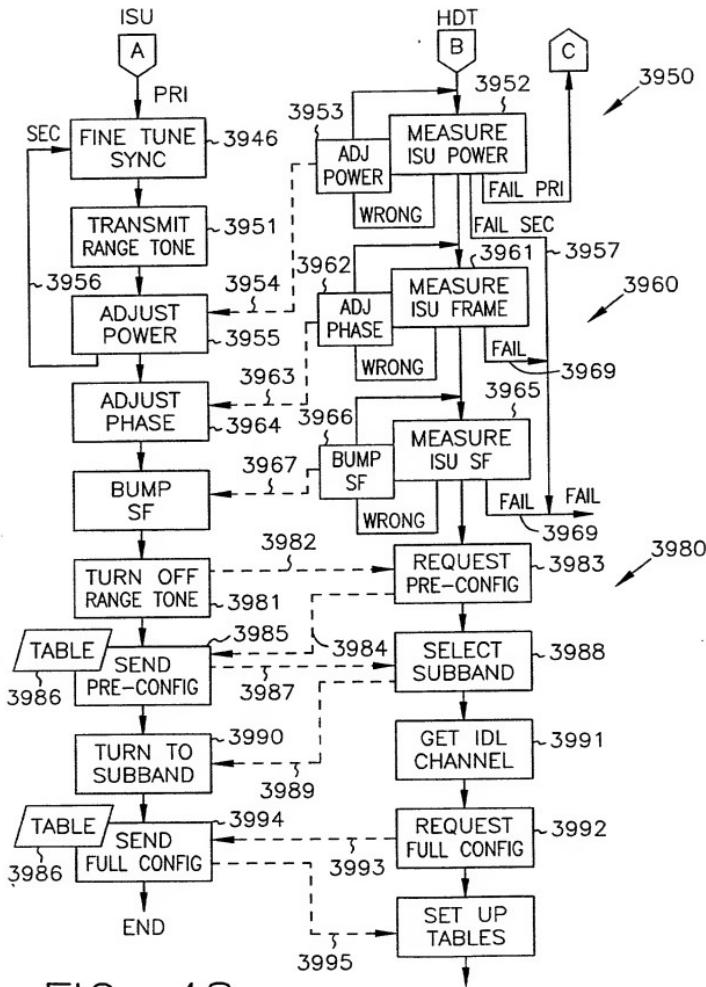


FIG. 48

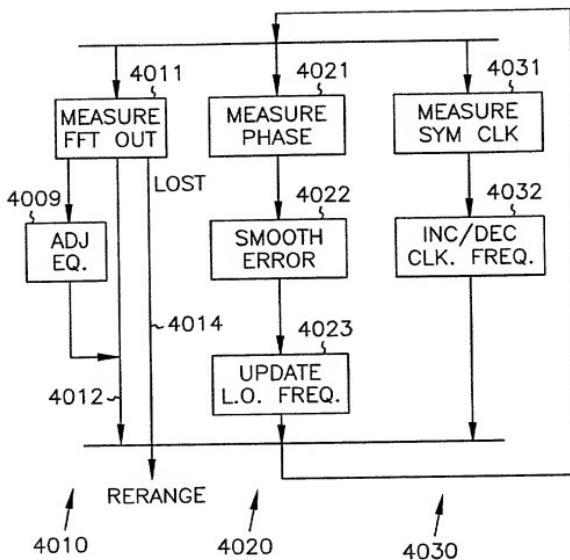


FIG. 49

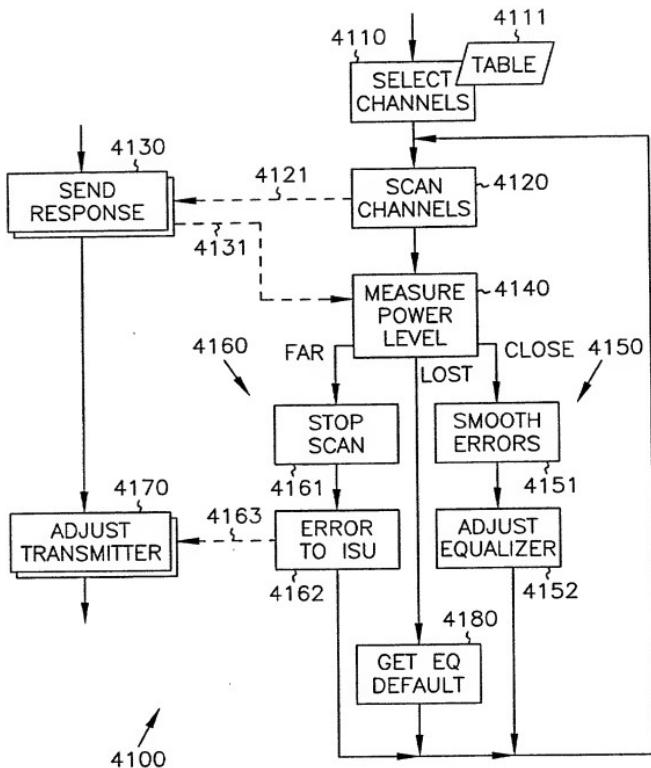
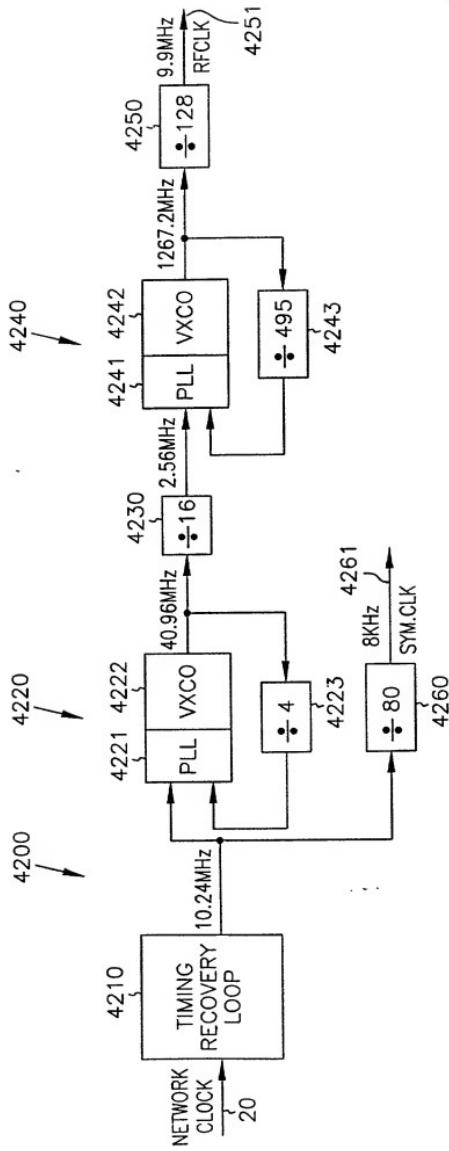


FIG. 50

FIG. 51



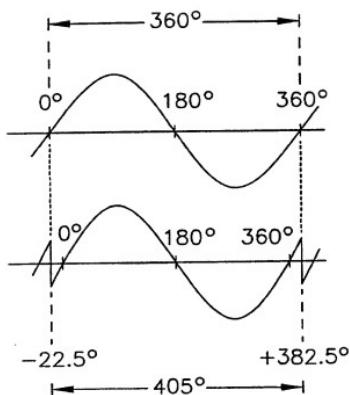


FIG. 52

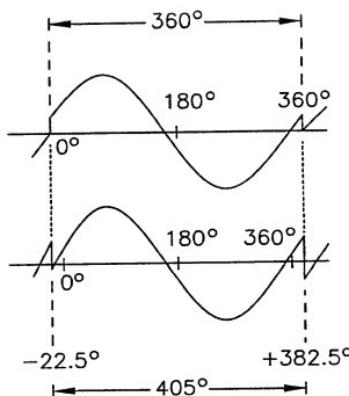
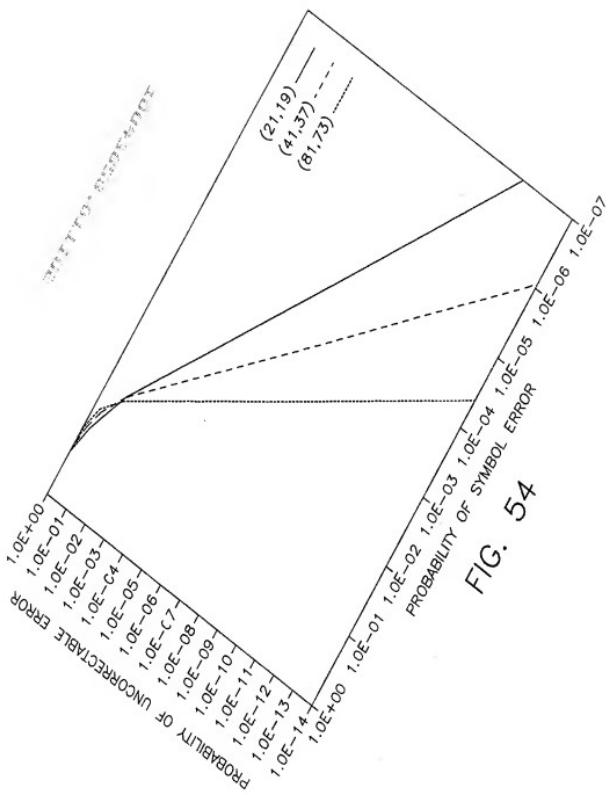


FIG. 53



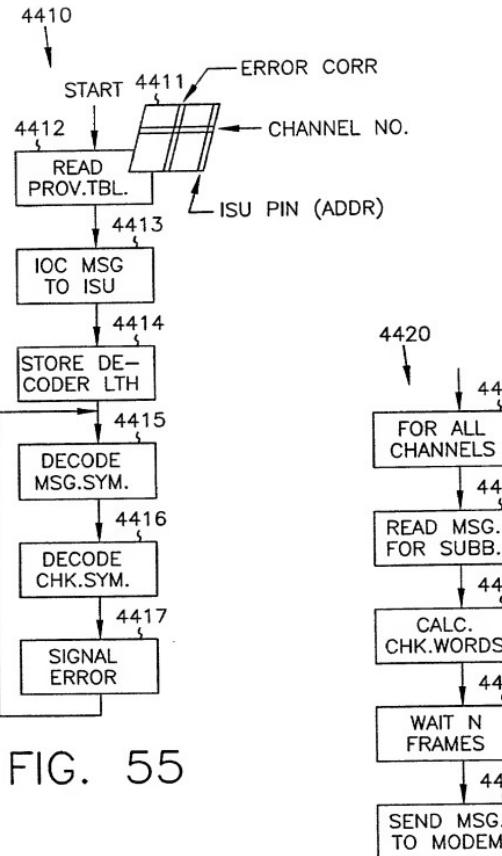


FIG. 55

FIG. 56

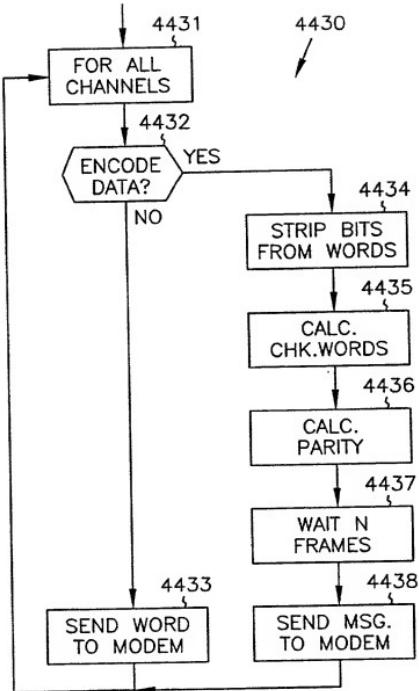


FIG. 57

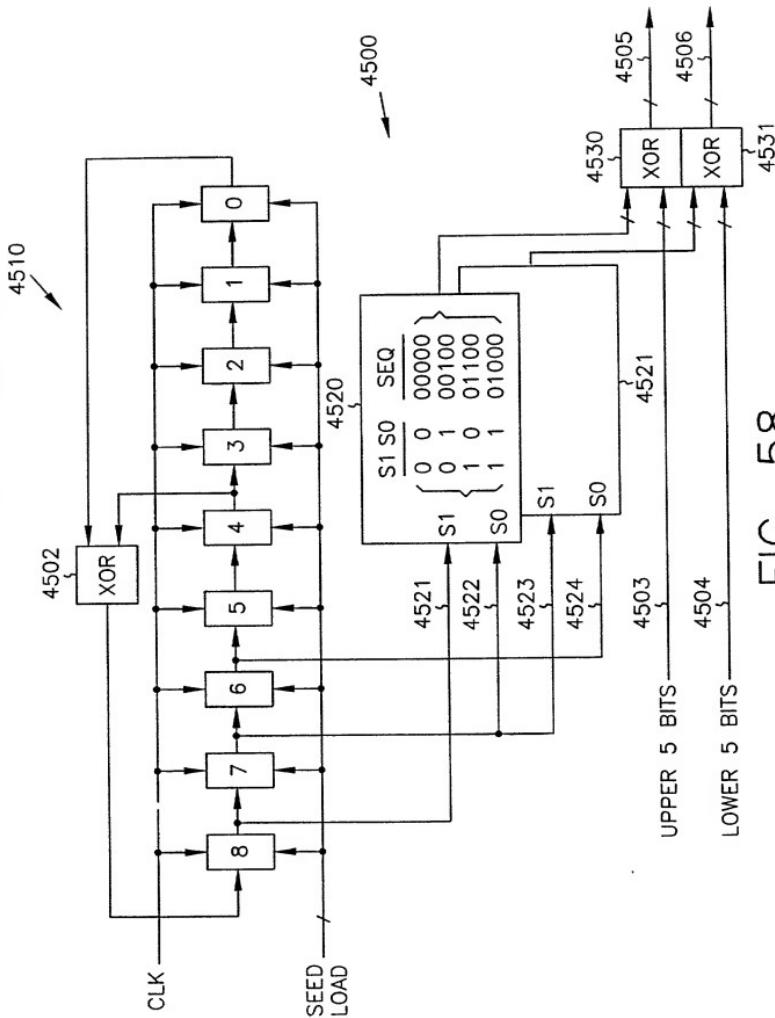


FIG. 58

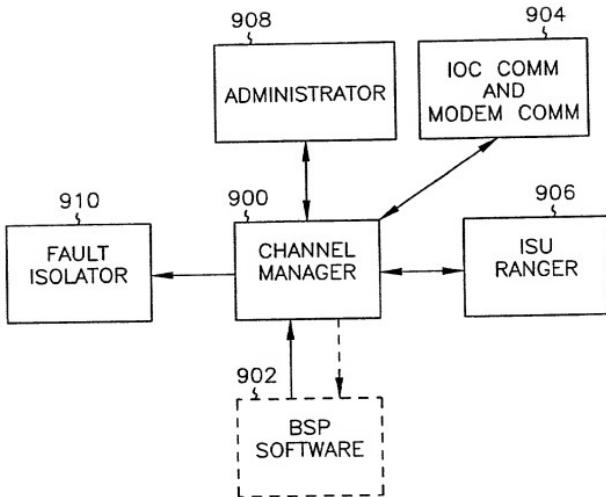


FIG. 59

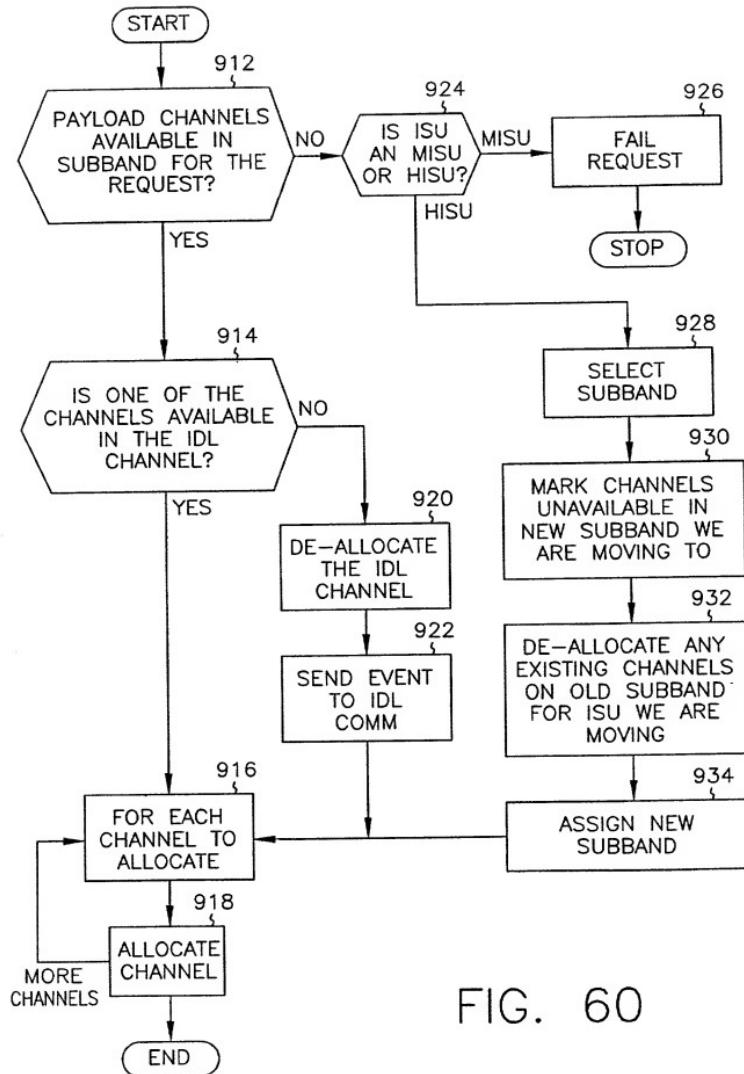


FIG. 60

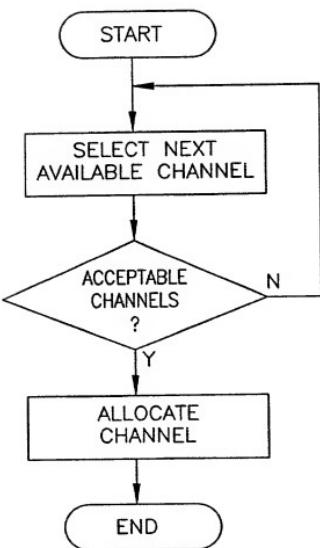


FIG. 61

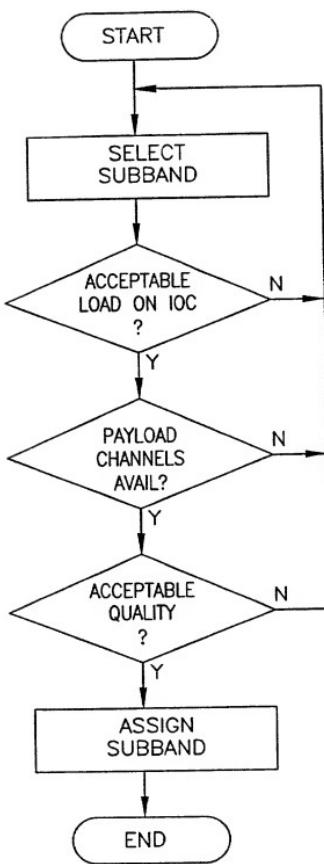


FIG. 62

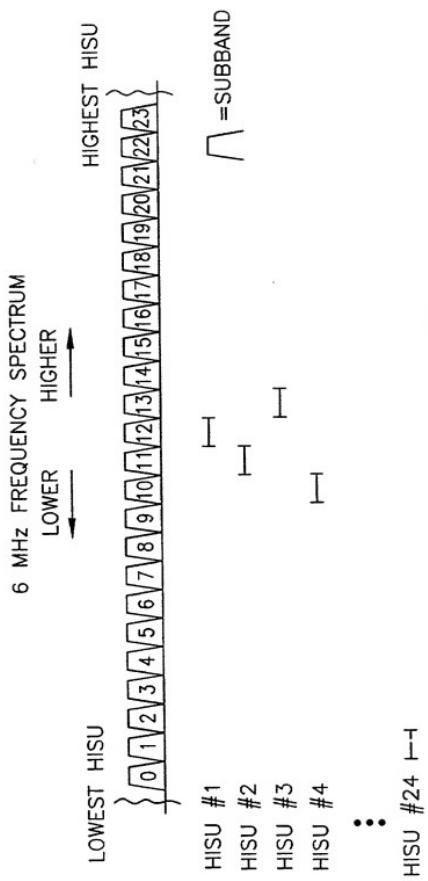


FIG. 63

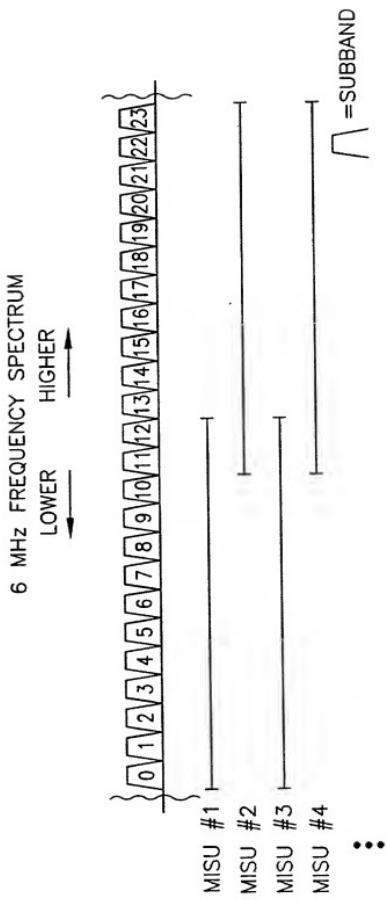


FIG. 64

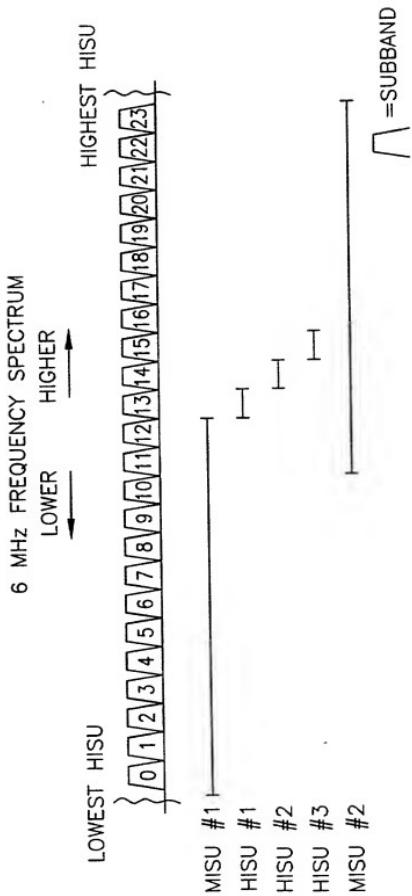


FIG. 65

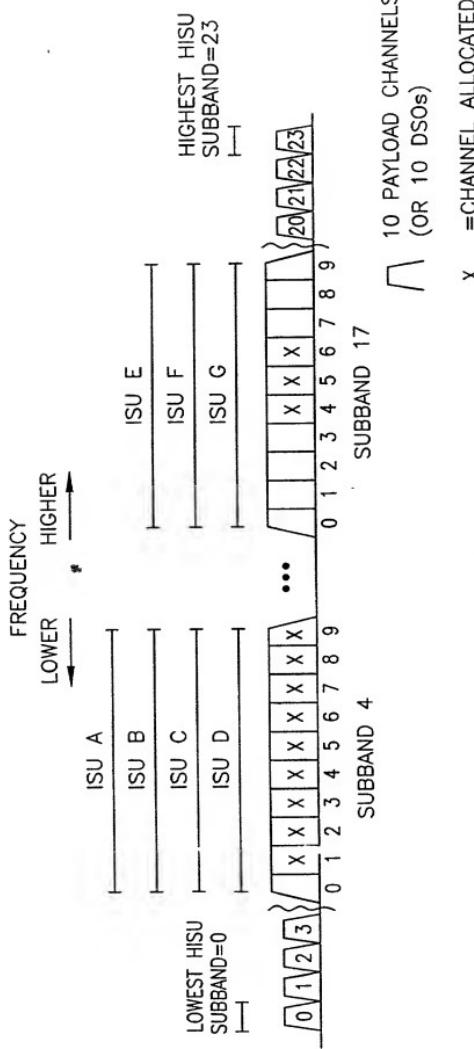


FIG. 66

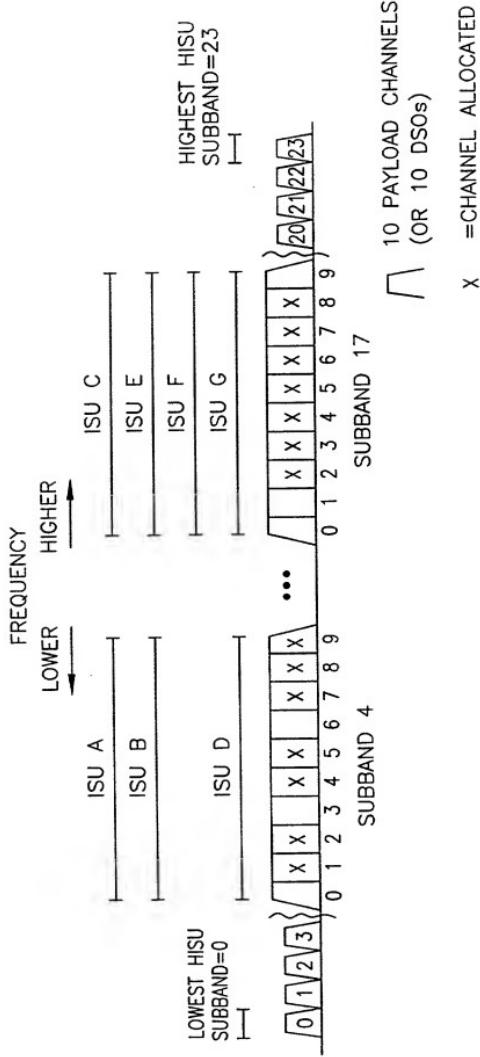


FIG. 67

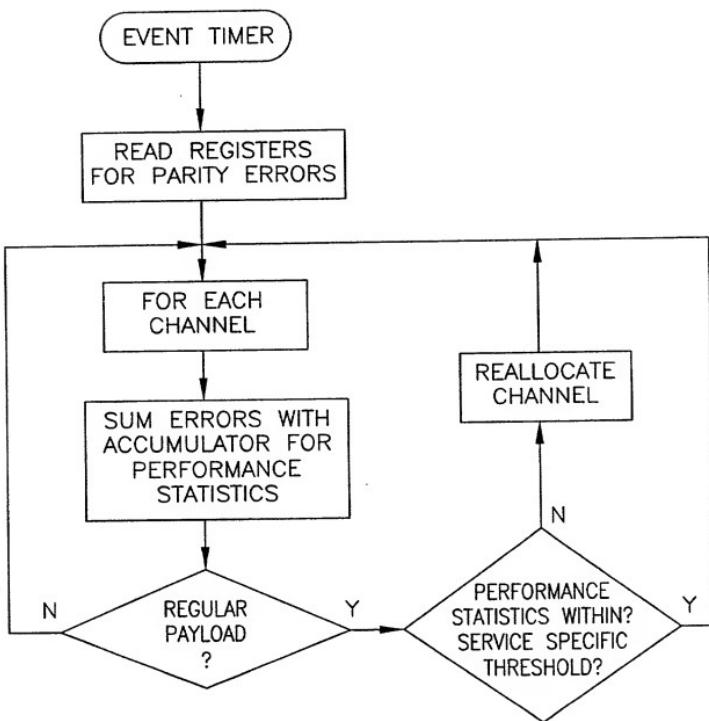


FIG. 68

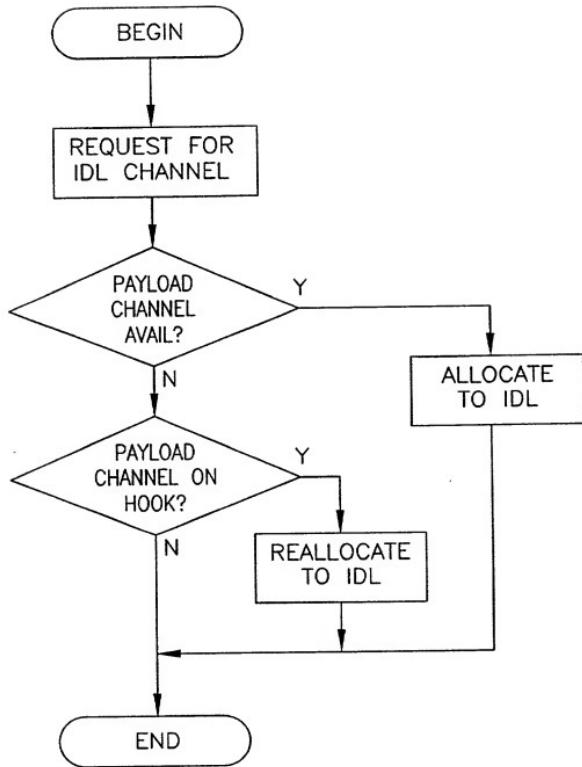


FIG. 69

FIG. 70

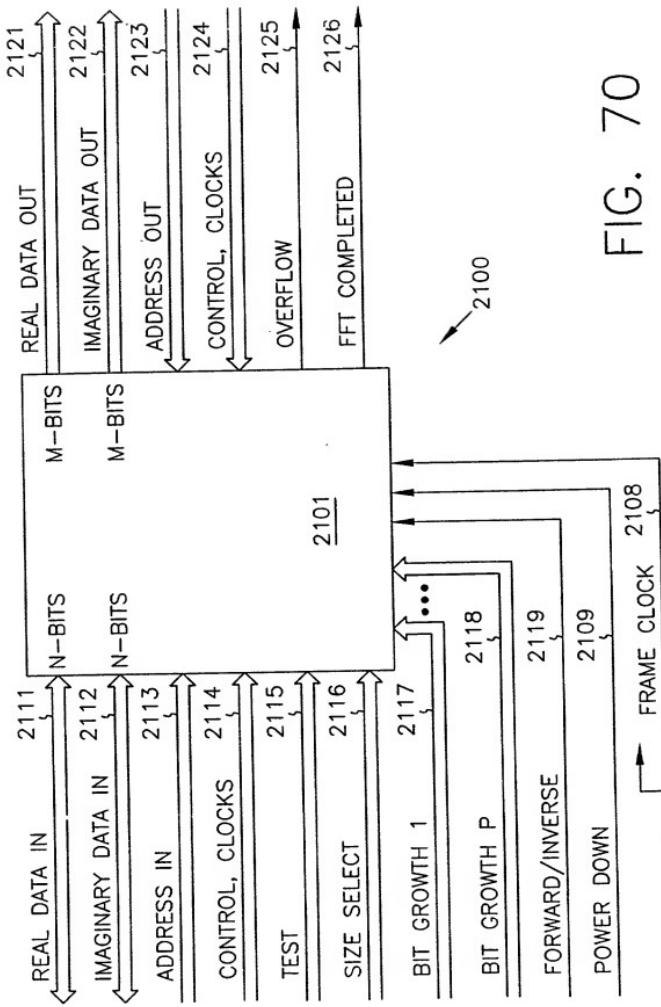
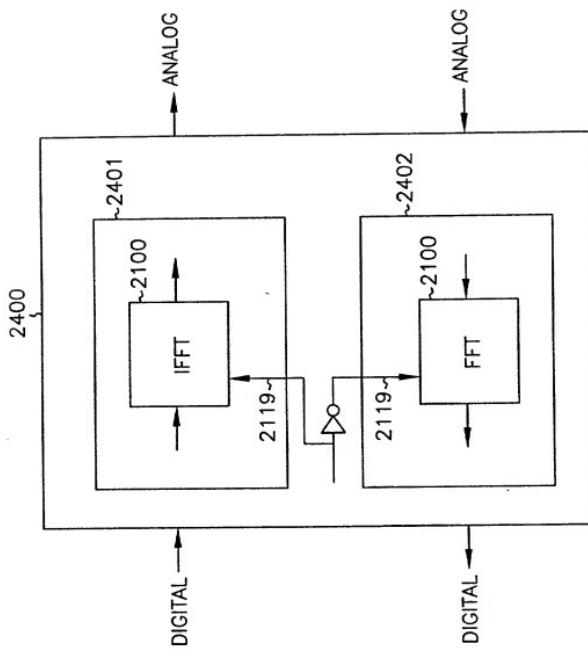


FIG. 71



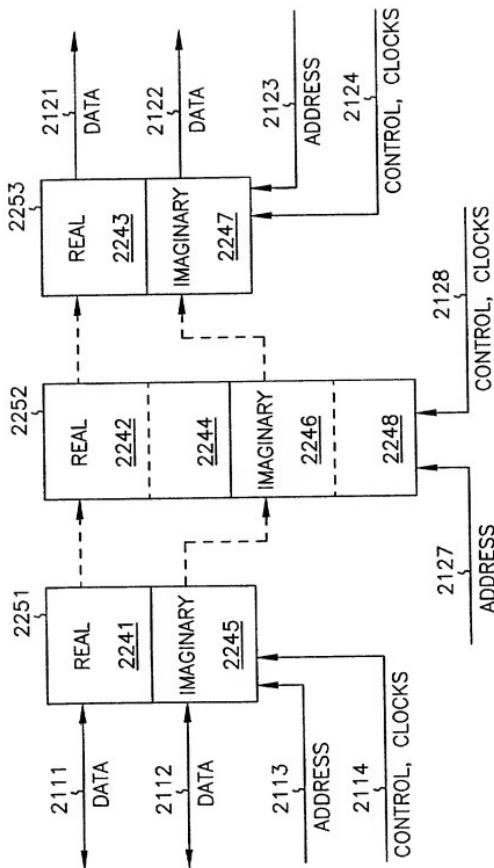


FIG. 72

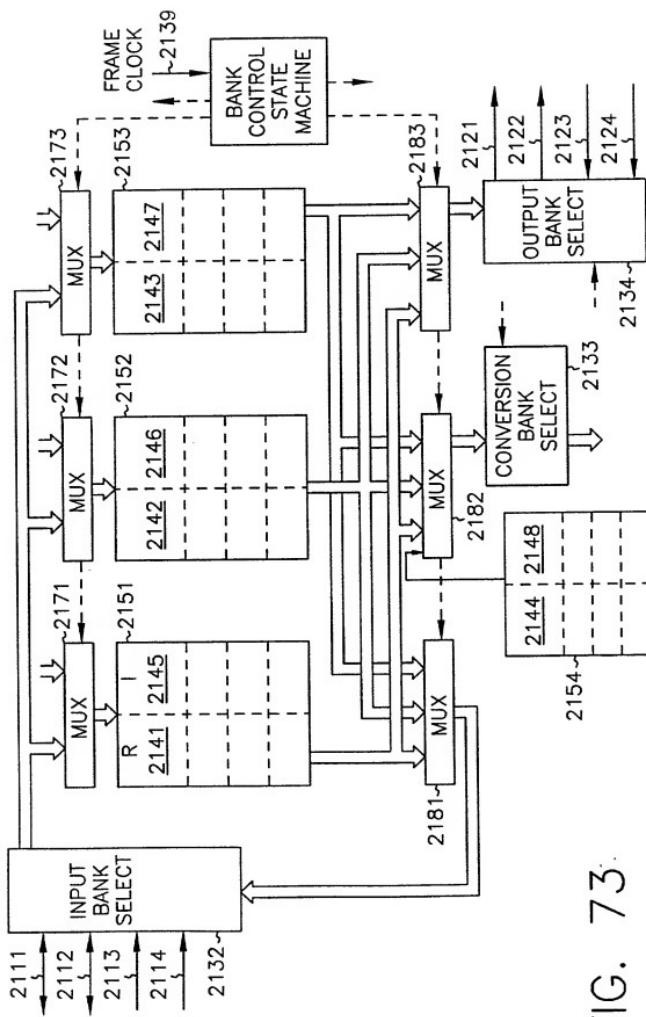
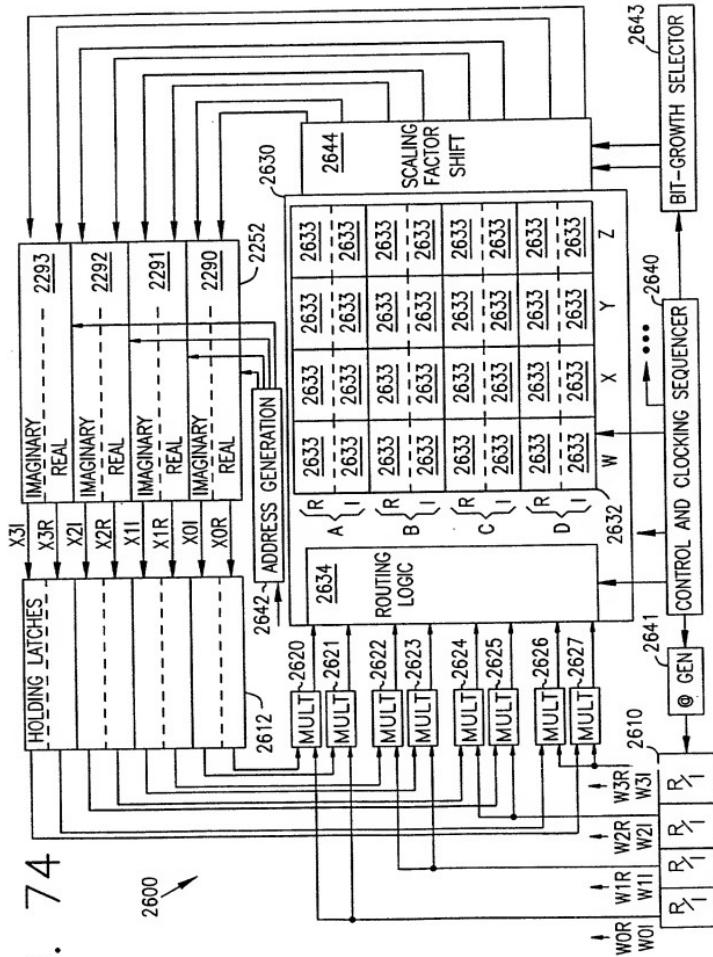


FIG. 73.

FIG. 74



THIS TABLE SHOWS THE ORDER OF CALCULATION FOR A TRANPOSED BUTTERFLY:

C0

$AWR = WR$	$AXR = XR$	$AYR = YR$	$AZR = ZR$
$AWI = WI$	$AXI = XI$	$AYI = YI$	$AZI = ZI$
$BWR = WR$	$BXR = XR$	$BYR = YR$	$BZR = ZR$
$BWI = WI$	$BXI = XI$	$BYI = YI$	$BZI = ZI$
$CWR = WR$	$CXR = XR$	$CYR = YR$	$CZR = ZR$
$CWI = WI$	$CXI = XI$	$CYI = YI$	$CZI = ZI$
$DWR = WR$	$DXR = XR$	$DYR = YR$	$DZR = ZR$
$DWI = WI$	$DXI = XI$	$DYI = YI$	$DZI = ZI$

FIG. 75

→ 2800

C1

$AWR = AWR - WI$	$AXR = AXR - XI$	$AYR = AYR - YI$	$AZR = AZR - ZI$
$AWI = AWI + WR$	$AXI = AXI + XR$	$AYI = AYI + YR$	$AZI = AZI + ZR$
$BWR = BWR - WI$	$BXR = BXR - XI$	$BYR = BYR - YI$	$BZR = BZR - ZI$
$BWI = BWI + WR$	$BXI = BXI + XR$	$BYI = BYI + YR$	$BZI = BZI + ZR$
$CWR = CWR - WI$	$CXR = CXR - XI$	$CYR = CYR - YI$	$CZR = CZR - ZI$
$CWI = CWI + WR$	$CXI = CXI + XR$	$CYI = CYI + YR$	$CZI = CZI + ZR$
$DWR = DWR - WI$	$DXR = DXR - XI$	$DYR = DYR - YI$	$DZR = DZR - ZI$
$DWI = DWI + WR$	$DXI = DXI + XR$	$DYI = DYI + YR$	$DZI = DZI + ZR$

FIG. 76

→ 2800

C2

$AWR=AWR + WR$	$AXR=AXR + XI$	$AYR=AYR - YR$	$AZR=AZR - ZI$
$AWI=AWI + WI$	$AXI=AXI - XR$	$AYI=AYI - YI$	$AZI=AZI + ZR$
$BWR=BWR + WR$	$BXR=BXR + XI$	$BYR=BYR - YR$	$BZR=BZR - ZI$
$BWI=BWI + WI$	$BXI=BXI - XR$	$BYI=BYI - YI$	$BZI=BZI + ZR$
$CWR=CWR + WR$	$CXR=CXR + XI$	$CYR=CYR - YR$	$CZR=CZR - ZI$
$CWI=CWI + WI$	$CXI=CXI - XR$	$CYI=CYI - YI$	$CZI=CZI + ZR$
$DWR=DWR + WR$	$DXR=DXR + XI$	$DYR=DYR - YR$	$DZR=DZR - ZI$
$DWI=DWI + WI$	$DXI=DXI - XR$	$DYI=DYI - YI$	$DZI=DZI + ZR$

FIG. 77

→ 2800

→ 2632

C3

$AWR=AWR - WI$	$AXR=AXR + XR$	$AYR=AYR + YI$	$AZR=AZR - ZR$
$AWI=AWI + WR$	$AXI=AXI + XI$	$AYI=AYI - YR$	$AZI=AZI - ZI$
$BWR=BWR - WI$	$BXR=BXR + XR$	$BYR=BYR + YI$	$BZR=BZR - ZR$
$BWI=BWI + WR$	$BXI=BXI + XI$	$BYI=BYI - YR$	$BZI=BZI - ZI$
$CWR=CWR - WI$	$CXR=CXR + XR$	$CYR=CYR + YI$	$CZR=CZR - ZR$
$CWI=CWI + WR$	$CXI=CXI + XI$	$CYI=CYI - YR$	$CZI=CZI - ZI$
$DWR=DWR - WI$	$DXR=DXR + XR$	$DYR=DYR + YI$	$DZR=DZR - ZR$
$DWI=DWI + WR$	$DXI=DXI + XI$	$DYI=DYI - YR$	$DZI=DZI - ZI$

FIG. 78

→ 2800

→ 2632

C4

$AWR=AWR + WR$	$AXR=AXR - XR$	$AYR=AYR + YR$	$AZR=AZR - ZR$
$AWI=AWI + WI$	$AXI=AXI - XI$	$AYI=AYI + YI$	$AZI=AZI - ZI$
$BWR=BWR + WR$	$BXR=BXR - XR$	$BYR=BYR + YR$	$BZR=BZR - ZR$
$BWI=BWI + WI$	$BXI=BXI - XI$	$BYI=BYI + YI$	$BZI=BZI - ZI$
$CWR=CWR + WR$	$CXR=CXR - XR$	$CYR=CYR + YR$	$CZR=CZR - ZR$
$CWI=CWI + WI$	$CXI=CXI - XI$	$CYI=CYI + YI$	$CZI=CZI - ZI$
$DWR=DWR + WR$	$DXR=DXR - XR$	$DYR=DYR + YR$	$DZR=DZR - ZR$
$DWI=DWI + WI$	$DXI=DXI - XI$	$DYI=DYI + YI$	$DZI=DZI - ZI$

FIG. 79

→ 2800

C5

$AWR=AWR - WI$	$AXR=AXR + XI$	$AYR=AYR - YI$	$AZR=AZR + ZI$
$AWI=AII + WR$	$AXI=AXI - XR$	$AYI=AYI + YR$	$AZI=AZI - ZR$
$BWR=BWR - WI$	$BXR=BXR + XI$	$BYR=BYR - YI$	$BZR=BZR + ZI$
$BWI=BWI + WR$	$BXI=BXI - XR$	$BYI=BYI + YR$	$BZI=BZI - ZR$
$CWR=CWR - WI$	$CXR=CXR + XI$	$CYR=CYR - YI$	$CZR=CZR + ZI$
$CWI=CWI + WR$	$CXI=CXI - XR$	$CYI=CYI + YR$	$CZI=CZI - ZR$
$DWR=DWR - WI$	$DXR=DXR + XI$	$DYR=DYR - YI$	$DZR=DZR + ZI$
$DWI=DWI + WR$	$DXI=DXI - XR$	$DYI=DYI + YR$	$DZI=DZI - ZR$

FIG. 80

→ 2800

C6

$AWR=AWR+WR$	$AXR=AXR-XI$	$AYR=AJR-YR$	$AZR=AZR+ZI$
$AWI=AWI+WI$	$AXI=AXI+XR$	$AYI=AJI-YI$	$AZI=AZI-ZR$
$BWR=BWR+WR$	$BXR=BXR-XI$	$BYR=BYR-YR$	$BZR=BZR+ZI$
$BWI=BWI+WI$	$BXI=BXI+XR$	$BYI=BYI-YI$	$BZI=BZI-ZR$
$CWR=CWR+WR$	$CXR=CXR-XI$	$CYR=CYR-YR$	$CZR=CZR+ZI$
$CWI=CWI+WI$	$CXI=CXI+XR$	$CYI=CYI-YI$	$CZI=CZI-ZR$
$DWR=DWR+WR$	$DXR=DXR-XI$	$DYR=DYR-YR$	$DZR=DZR+ZI$
$DWI=DWI+WI$	$DXI=DXI+XR$	$DYI=DYI-YI$	$DZI=DZI-ZR$

FIG. 81

→ 2800

→ 2632

C7

$AWR=AJR-WI$	$AXR=AXR-XR$	$AYR=AJR+YI$	$AZR=AZR-ZR$
$AWI=AWI+WI$	$AXI=AXI-XI$	$AYI=AJI-YI$	$AZI=AZI+ZI$
$BWR=BWR-WI$	$BXR=BXR-XR$	$BYR=BYR+YI$	$BZR=BZR-ZR$
$BWI=BWI+WR$	$BXI=BXI-XI$	$BYI=BYI-YR$	$BZI=BZI+ZI$
$CWR=CWR-WI$	$CXR=CXR-XR$	$CYR=CYR+YI$	$CZR=CZR-ZR$
$CWI=CWI+WR$	$CXI=CXI-XI$	$CYI=CYI-YR$	$CZI=CZI+ZI$
$DWR=DWR-WI$	$DXR=DXR-XR$	$DYR=DYR+YI$	$DZR=DZR-ZR$
$DWI=DWI+WR$	$DXI=DXI-XI$	$DYI=DYI-YR$	$DZI=DZI+ZI$

FIG. 82

→ 2800

→ 2632

THIS TABLE SHOWS THE ORDER OF CALCULATION FOR A TRANSPOSED BUTTERFLY:

C0

$AWR = WR + XR + YR + ZR$	$AXR = WR - XI - YR + ZI$	$AYR = WR - XR + YR - ZR$	$AZR = WR + XI - YR - ZI$
$AWI = WI + XI + YI + ZI$	$AXI = WI + XR - XI - ZR$	$AYI = WI - XI + YI - ZI$	$AZI = WI - XR - YI + ZR$
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

2632

2810

FIG. 83

C1

$AWR = AWR - (WI + XI + YI + ZI)$	$AXR = AXR - (WI + XI + YI - ZR)$	$AYR = AYR - (WI - XI + YI - ZI)$	$AZR = AZR - (WI - XI - YI + ZR)$
$AWI = AWI + (WR + XR + YR + ZR)$	$AXI = AXI + (WR - XI - YR + ZI)$	$AYI = AYI + (WR - XI + YR - ZR)$	$AZI = AZI + (WR + XI - YR - ZI)$
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

2632

2810

FIG. 84

C2

-	-	-	-	-
$BWR = WR + XR + YR + ZR$ $BWI = WI + XI + YI + ZI$	$BXR = WR - XI - YR - ZI$ $BXI = WI + XR - YI - ZR$	$BYR = WR - XR + YR - ZR$ $BYI = WI - XI + YI - ZI$	$BZR = WR + XI - YR - ZI$ $BZI = WI - XR - YI + ZR$	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

2632

2810  
↙

FIG. 85

C3

-	-	-	-	-
$BWR = WR - (WI + XI + YI + ZI)$ $BWI = WI + (WR + XR + YR + ZR)$	$BXR = WR - (WI + XR - YI - ZR)$ $BXI = WI + (WR - XI - YR + ZR)$	$BYR = BYR - (WI - XI + YI - ZI)$ $BYI = BYI + (WR - XR + YR - ZR)$	$BZR = BZR - (WI - XR - YI + ZR)$ $BZI = BZI + (WR + XI - YR - ZI)$	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

2632

2810  
↙

FIG. 86

C4

-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
$CWR = WR + XR + YR + ZR$	$CXR = WR - X - Y - Z$	$CYR = WR - X - Y + Z$	$CZR = WR + X - Y - Z$	2810 ↘
$CWI = WI + XI + YI + ZI$	$CXI = WI - X - Y - Z$	$CYI = WI - X - Y + Z$	$CZI = WI - X - Y - Z$	
-	-	-	-	-
-	-	-	-	-

FIG. 87

C5

-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
$CWR = CWR - (WI + XI + YI + ZI)$	$CXR = CXR - (WI + XI + YI - ZI)$	$CYR = CYR - (WI - XI + YI - ZI)$	$CZR = CZR - (WI - XI - YI + ZI)$	2810 ↘
$CWI = CWI + (WR + XR + YR + ZR)$	$CXI = CXI + (WR - XI - YR + ZI)$	$CYI = CYI + (WR - XI + YR + ZI)$	$CZI = CZI + (WR + XI - YR - ZI)$	
-	-	-	-	-
-	-	-	-	-

FIG. 88

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C6

-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
$DWR = WR + XR + YR + ZR$ $DWI = WI + XI + YI + ZI$	$DXR = WR - XI - YR + ZI$ $DXI = WI + XR - YI - ZR$	$DYR = WR - XR + YR - ZR$ $DYI = WI - XI + YI - ZI$	$DZR = WR + XI - YR - ZI$ $DZI = WI - XR - YI + ZR$	

2810  
→

C2632

FIG. 89

C7

-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
$DWR = DWI - (WI + XI + YI + ZI)$ $DWI = DWI + (WR + XR + YR + ZR)$	$DXR = DXR - (WI + XR - YI - ZR)$ $DXI = DXI + (WR - XI - YR + ZI)$	$DYR = DYR - (WI - XI + YI - ZI)$ $DYI = DYI + (WR - XR + YR - ZR)$	$DZR = DZR - (WI - XR - YI + ZR)$ $DZI = DZI + (WR + XI - YR - ZI)$	

2632  
→

FIG. 90

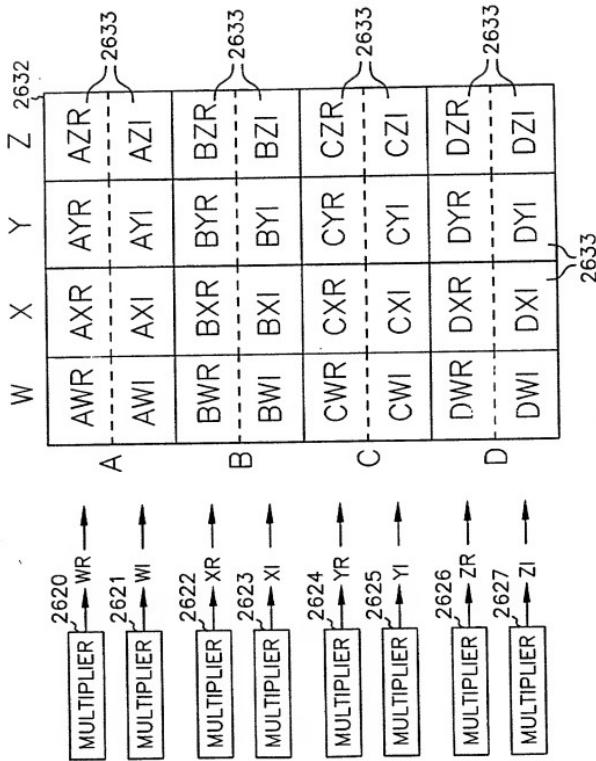


FIG. 91

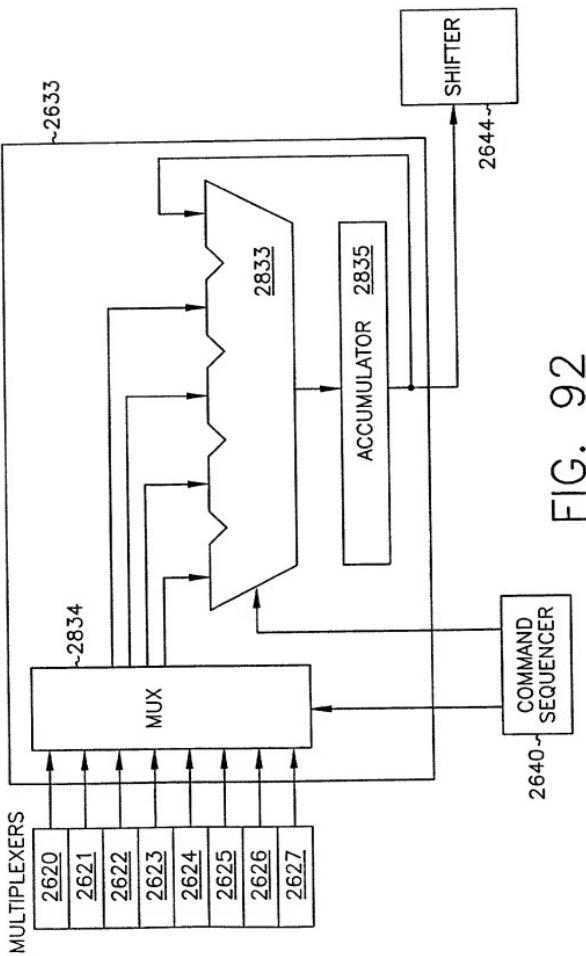


FIG. 92

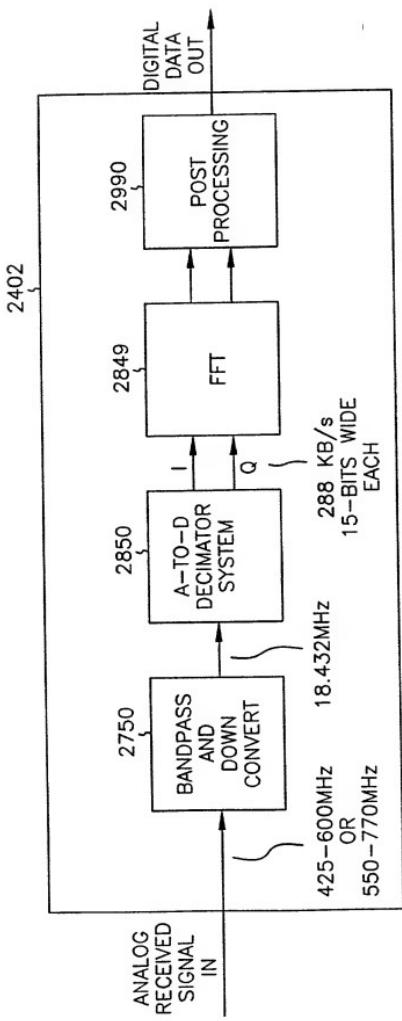


FIG. 93

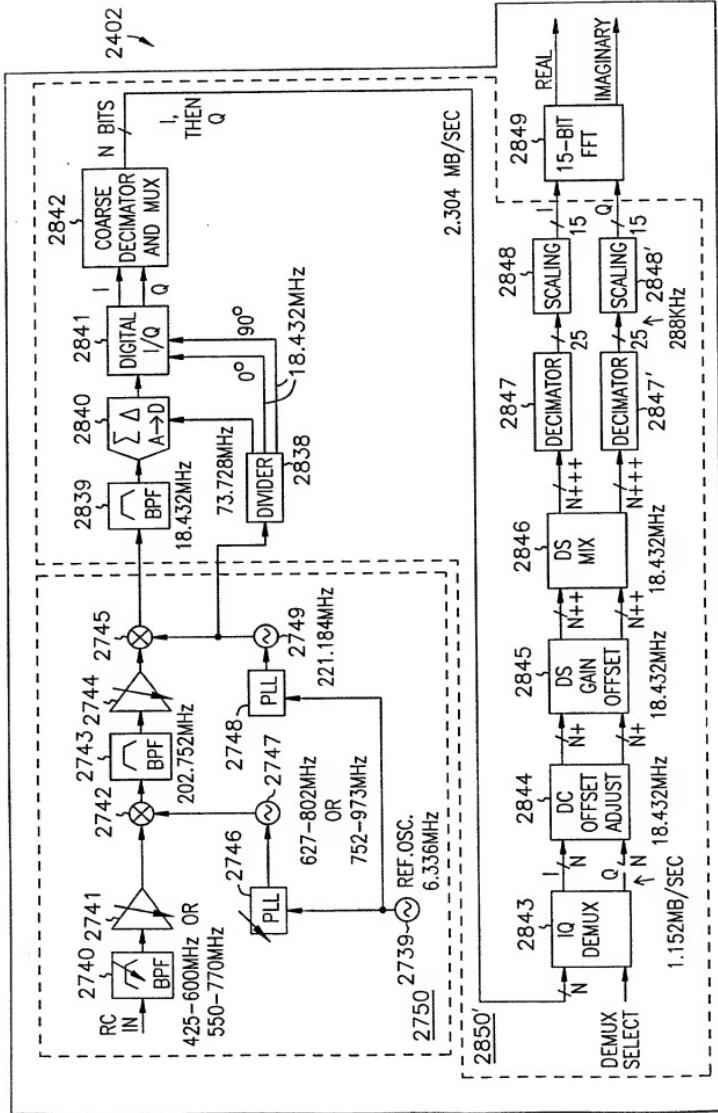


FIG. 94

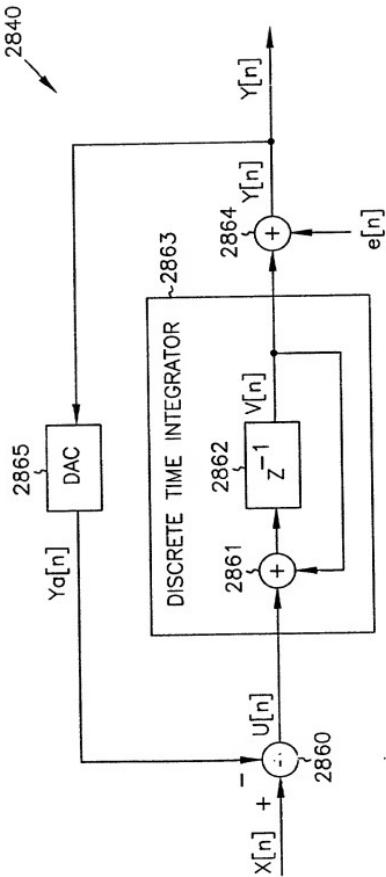


FIG. 95

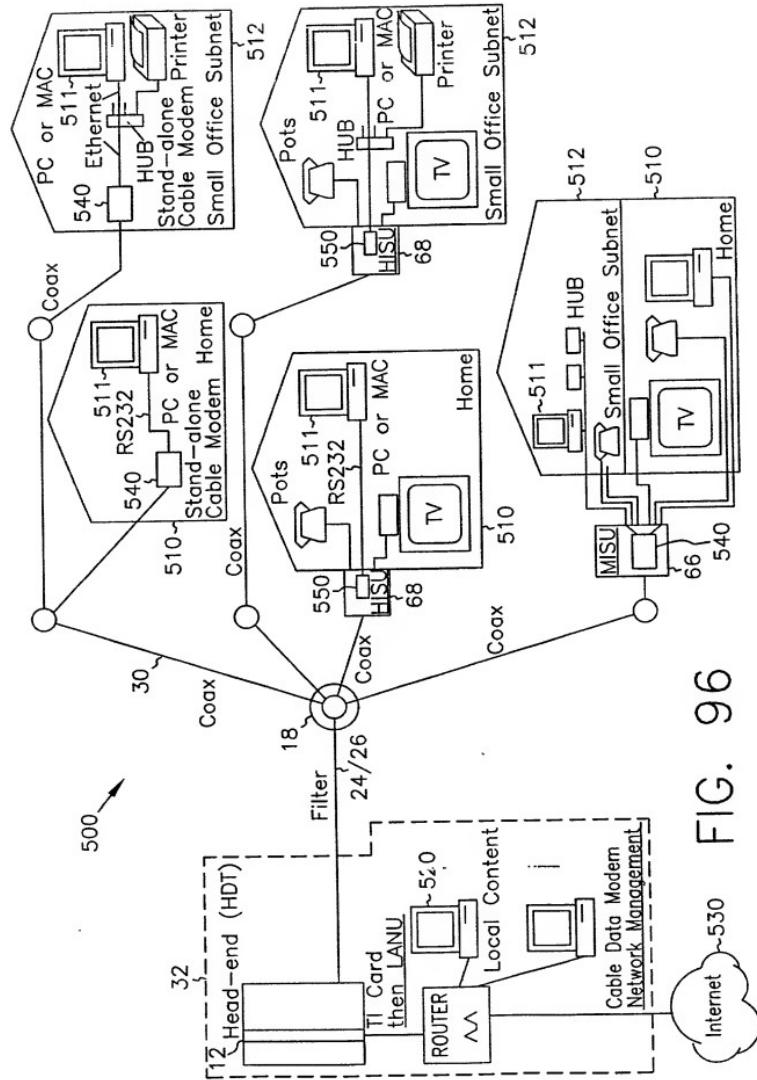
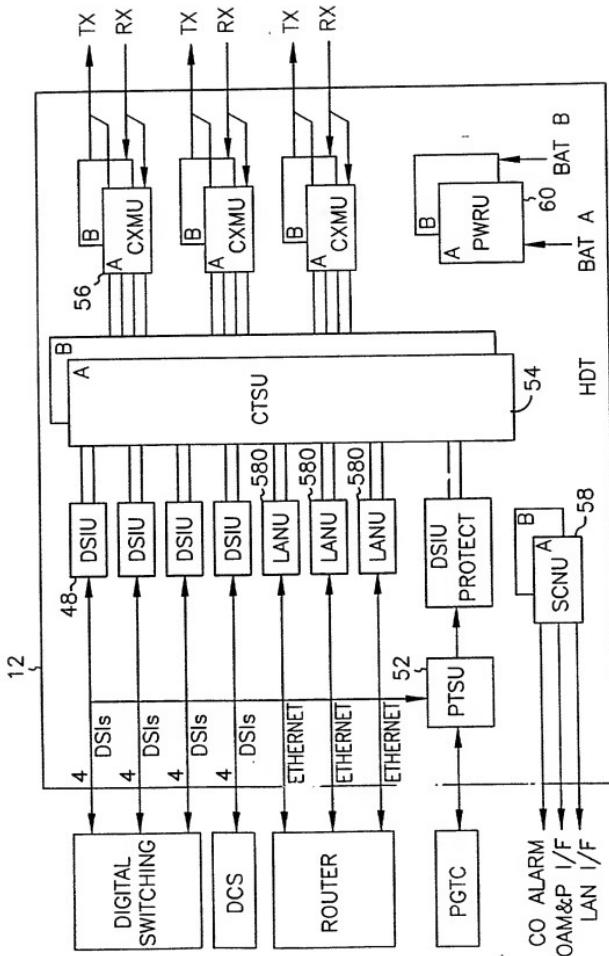


FIG. 96

FIG. 97



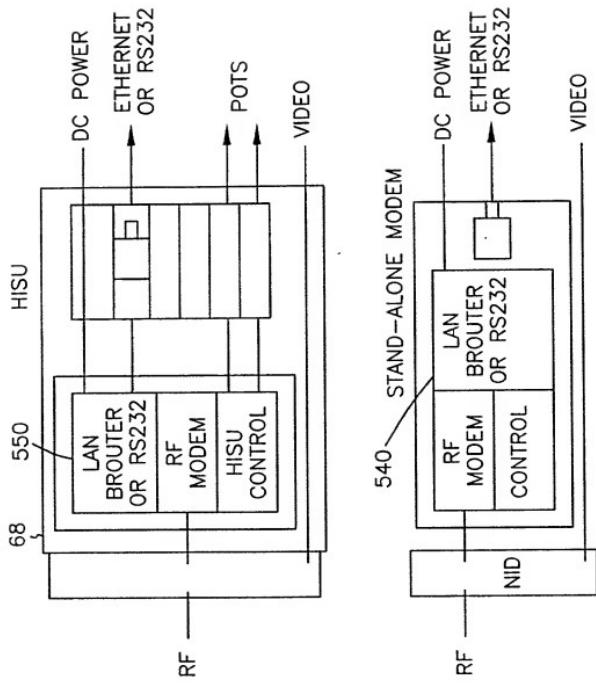


FIG. 98

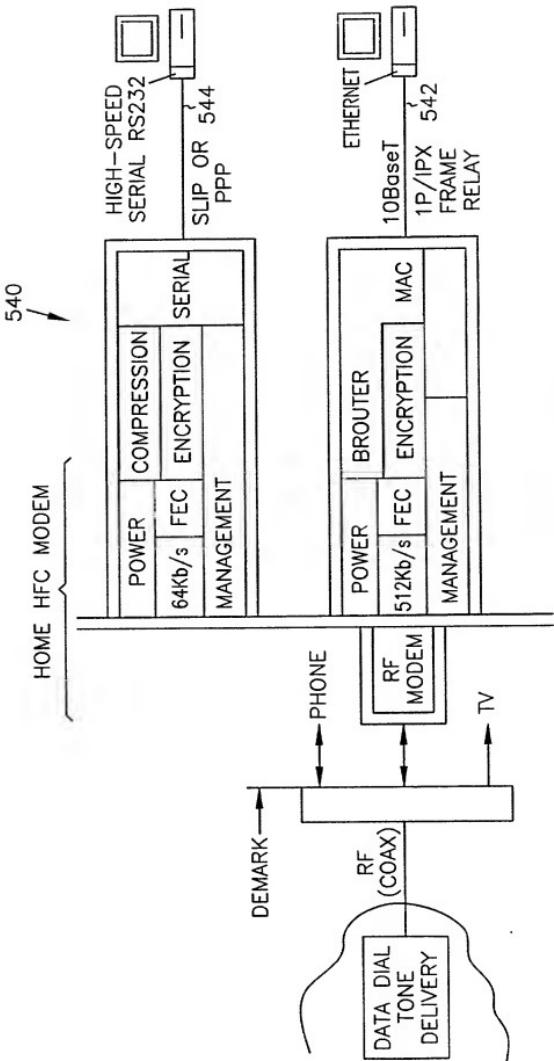


FIG. 99

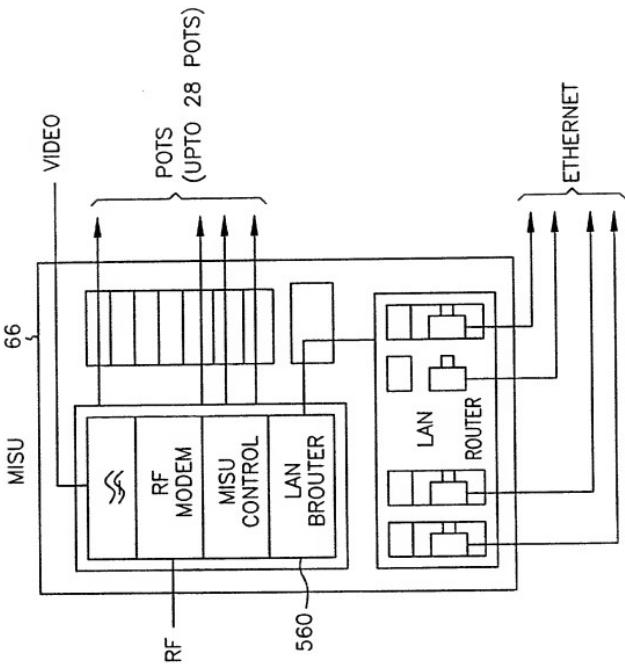


FIG. 100

FIG. 101

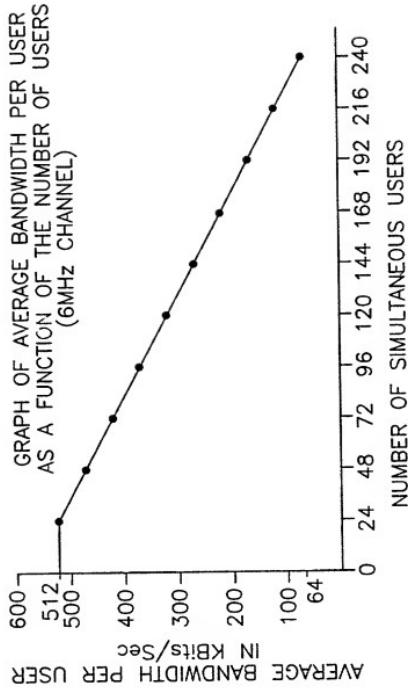
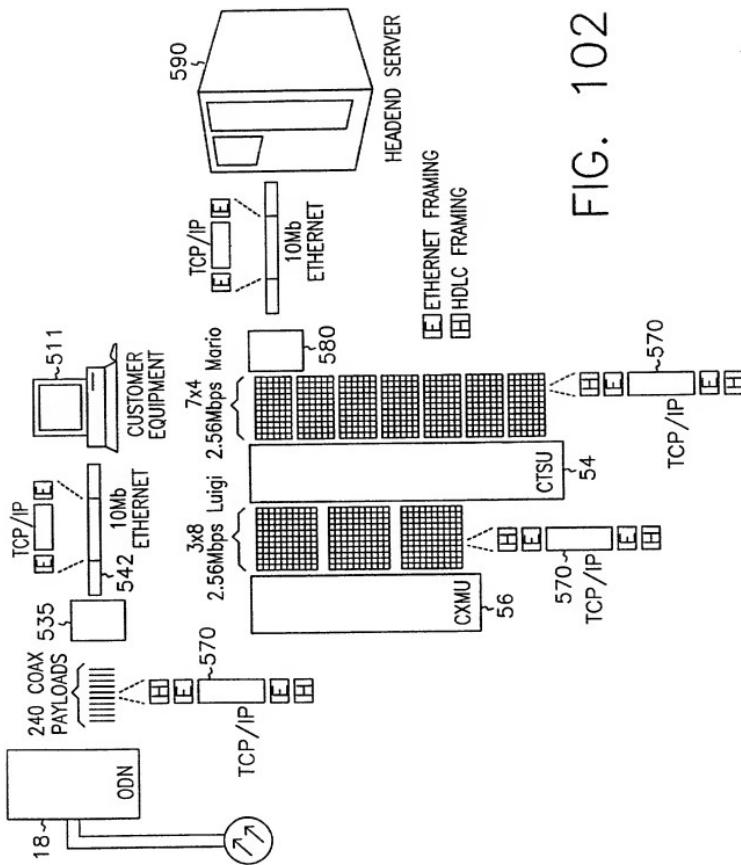


FIG. 102



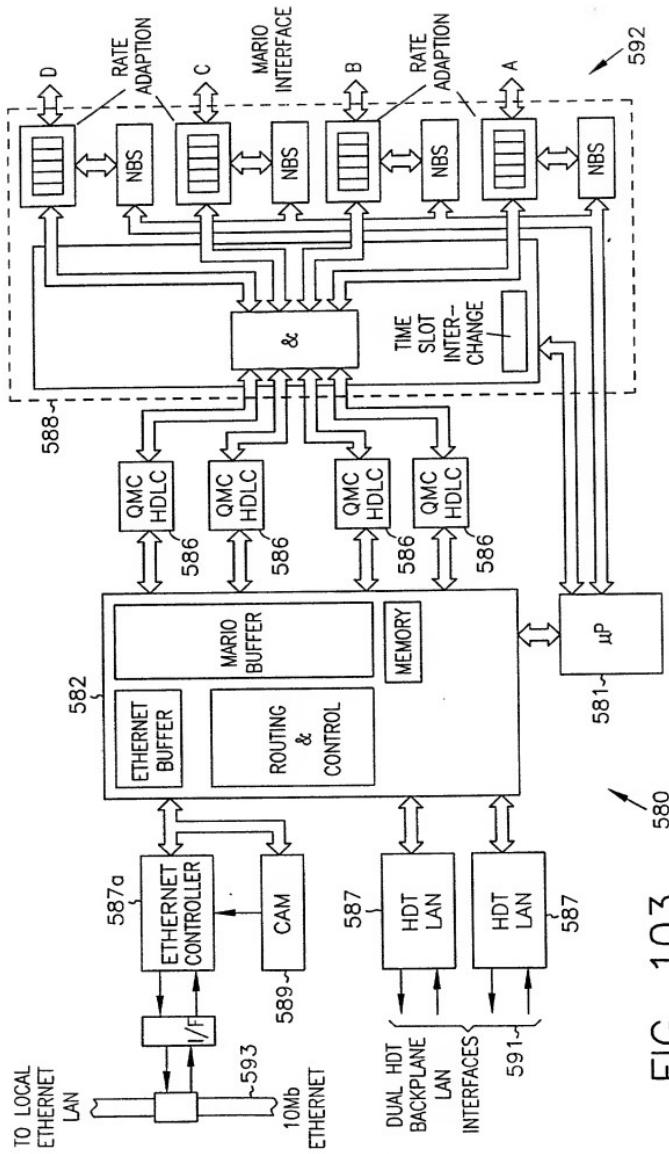


FIG. 103

FIG. 104

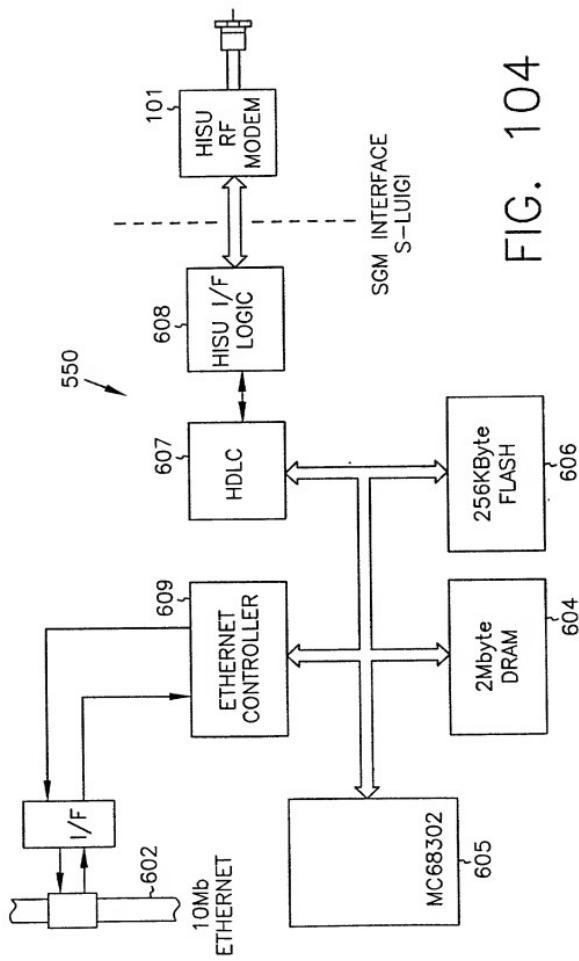
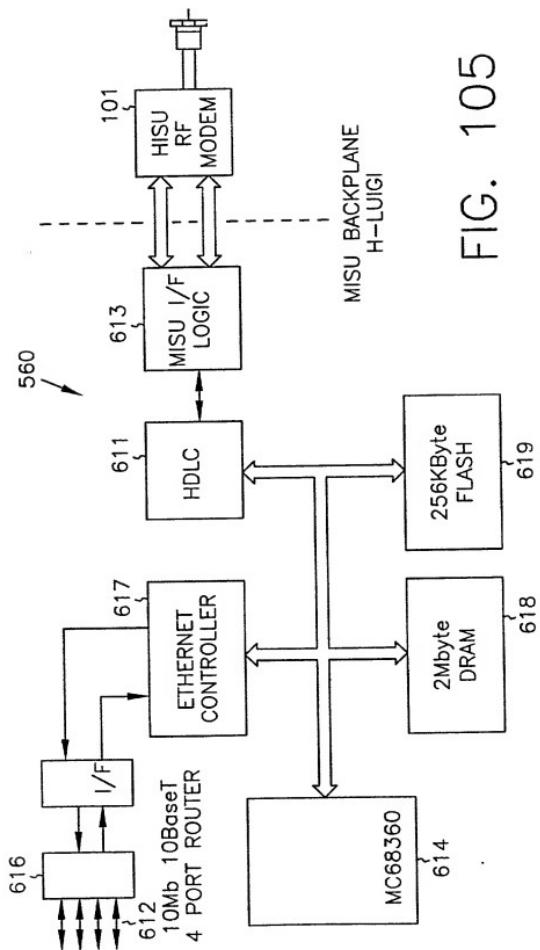


FIG. 105



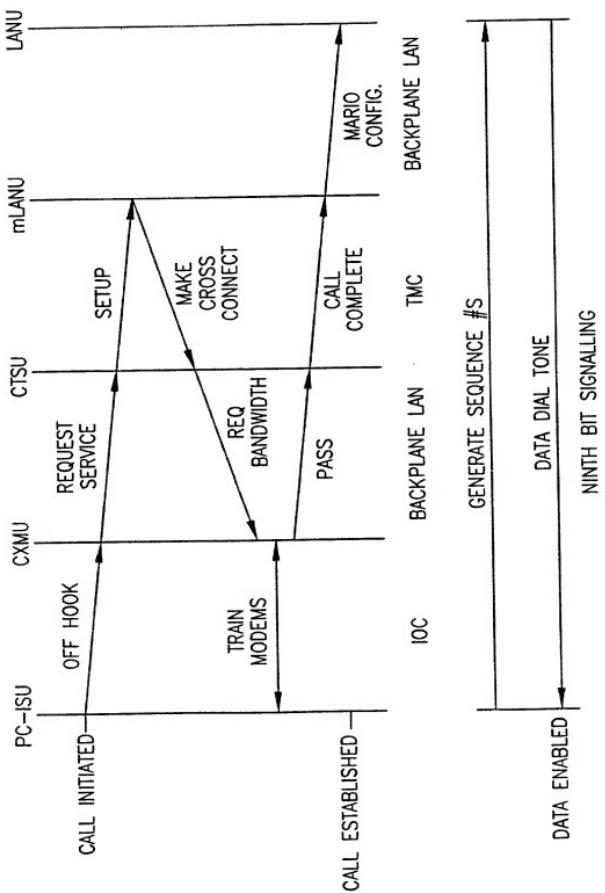


FIG. 106

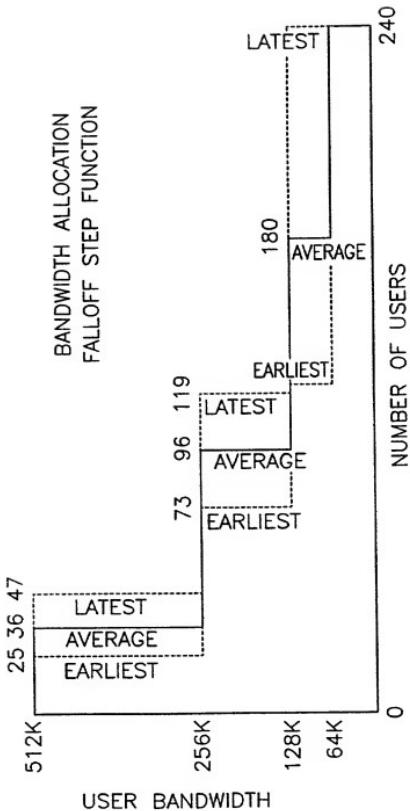


FIG. 107

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

THE RF SPECTRUM OF 24 USERS WITH 512Kbs

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

ADDING THE 25th USER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

ADDING THE 26th USER, ETC

FIG. 108

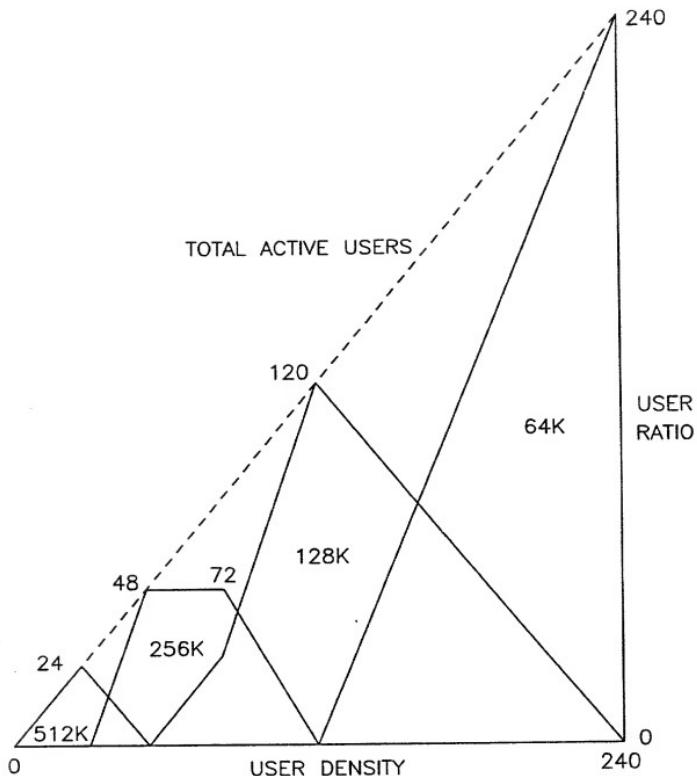


FIG. 109

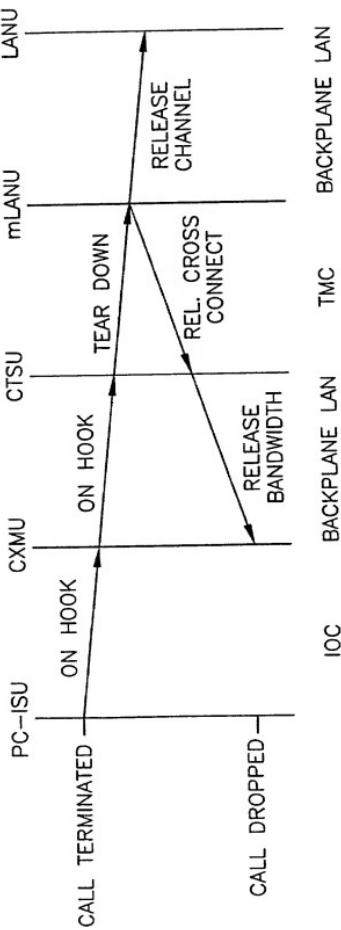


FIG. 110

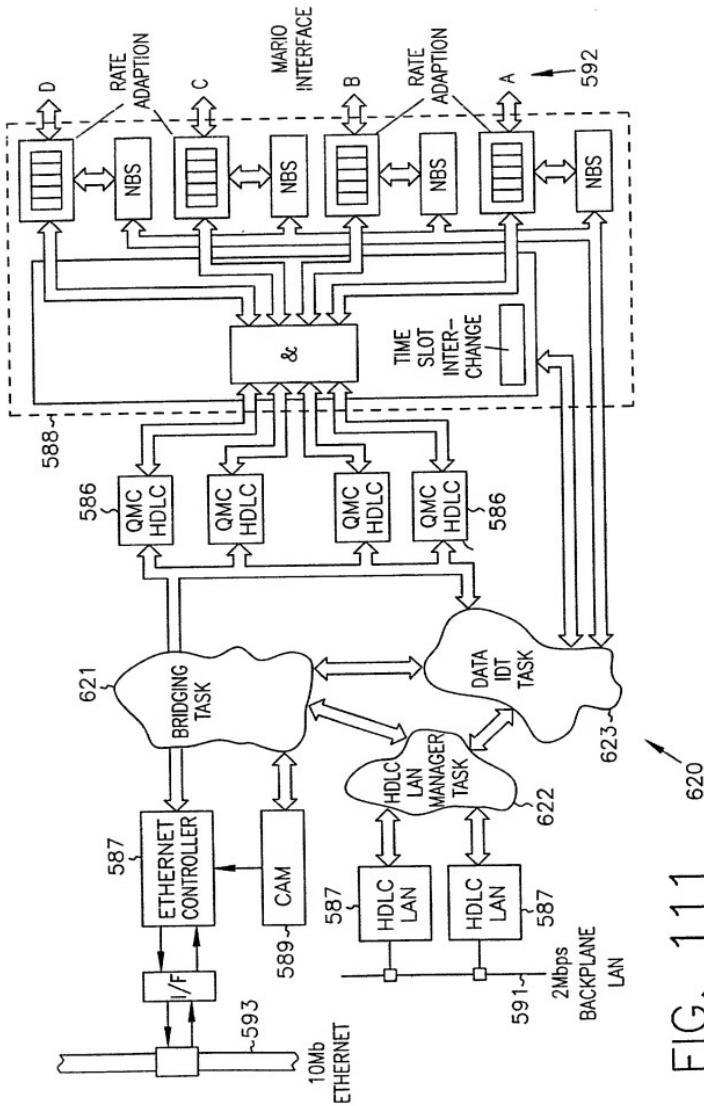
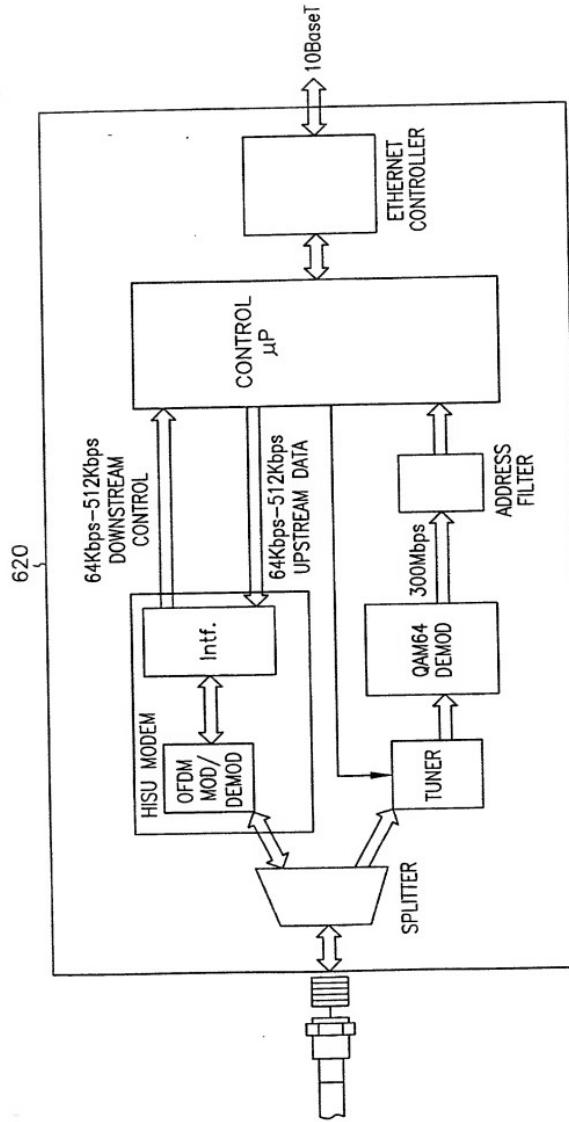


FIG. 111

FIG. 112



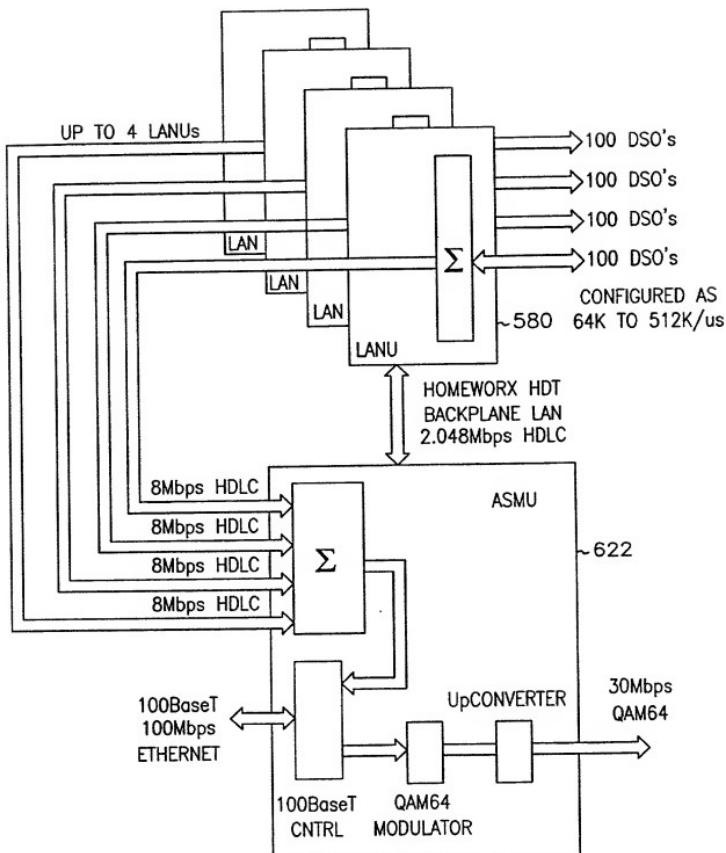


FIG. 113

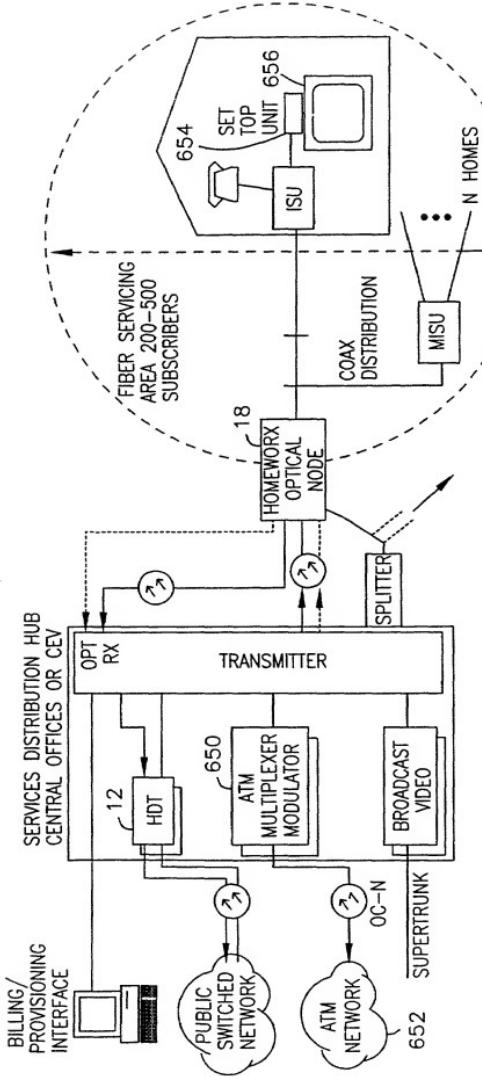


FIG. 114

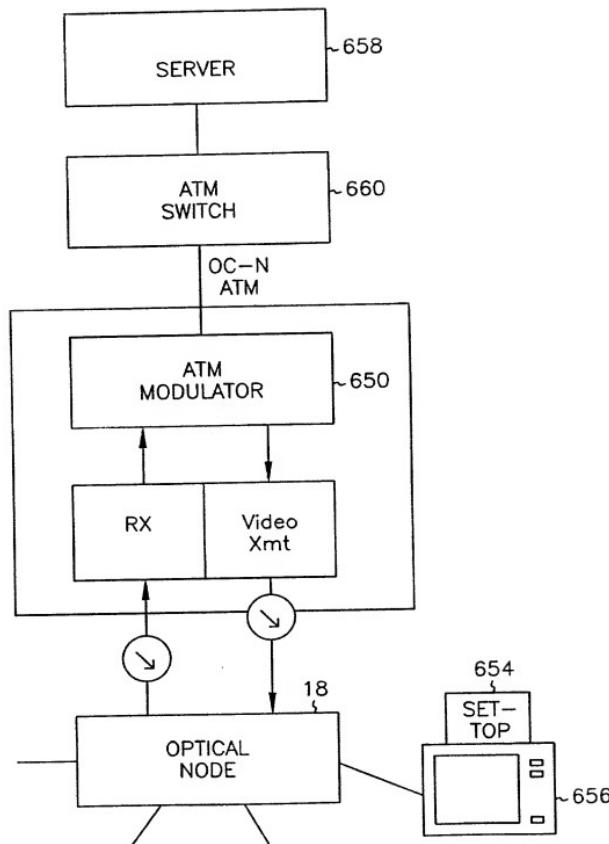


FIG. 115

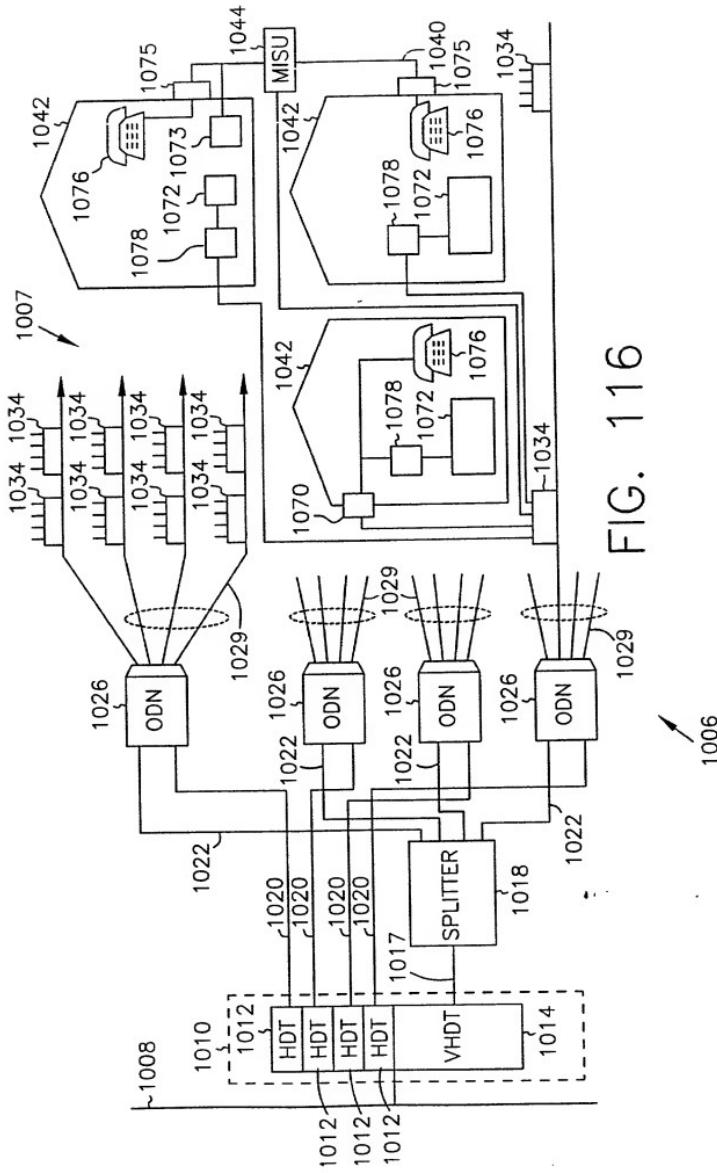


FIG. 116

1006

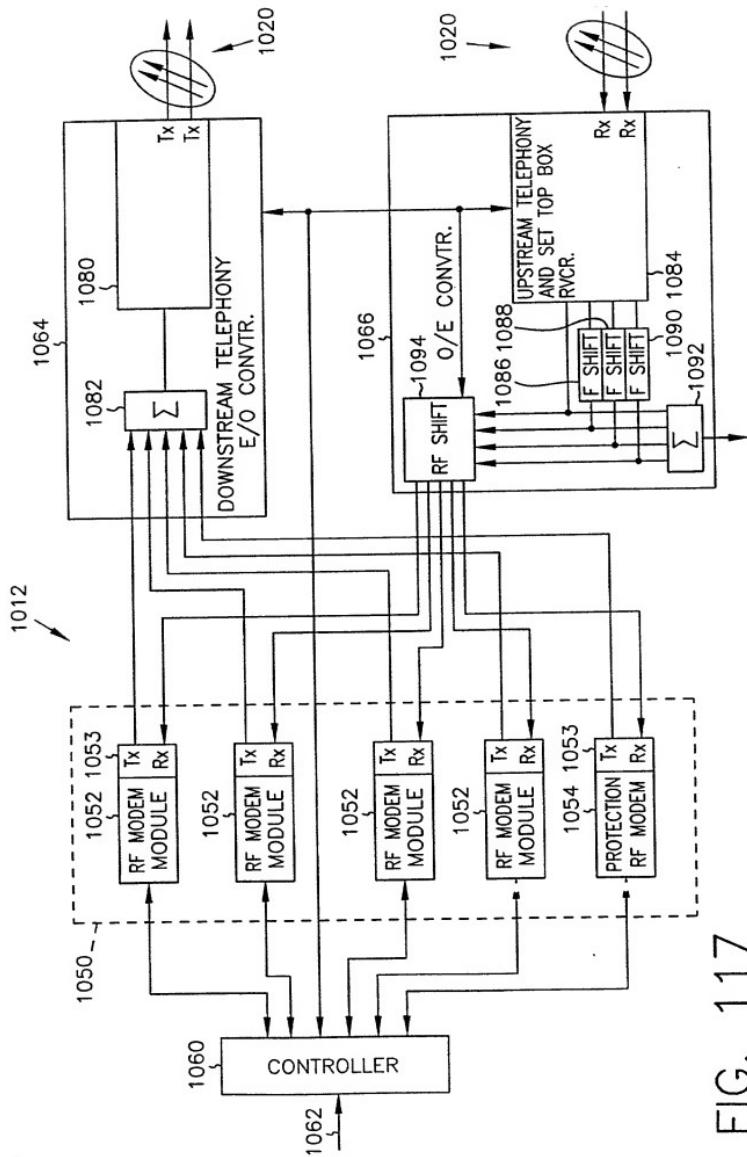
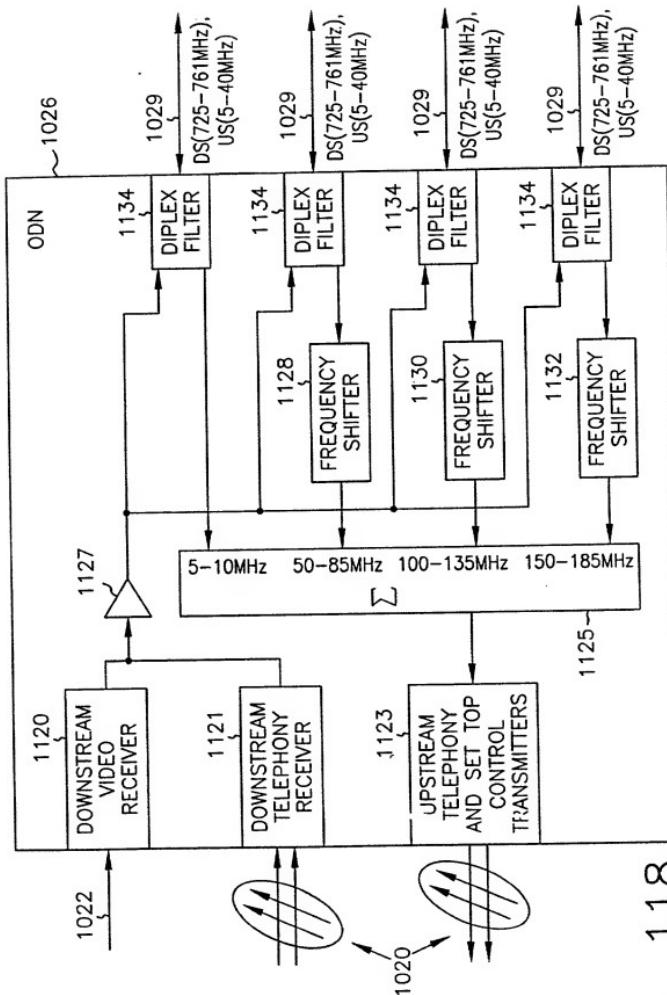


FIG. 117

FIG. 118



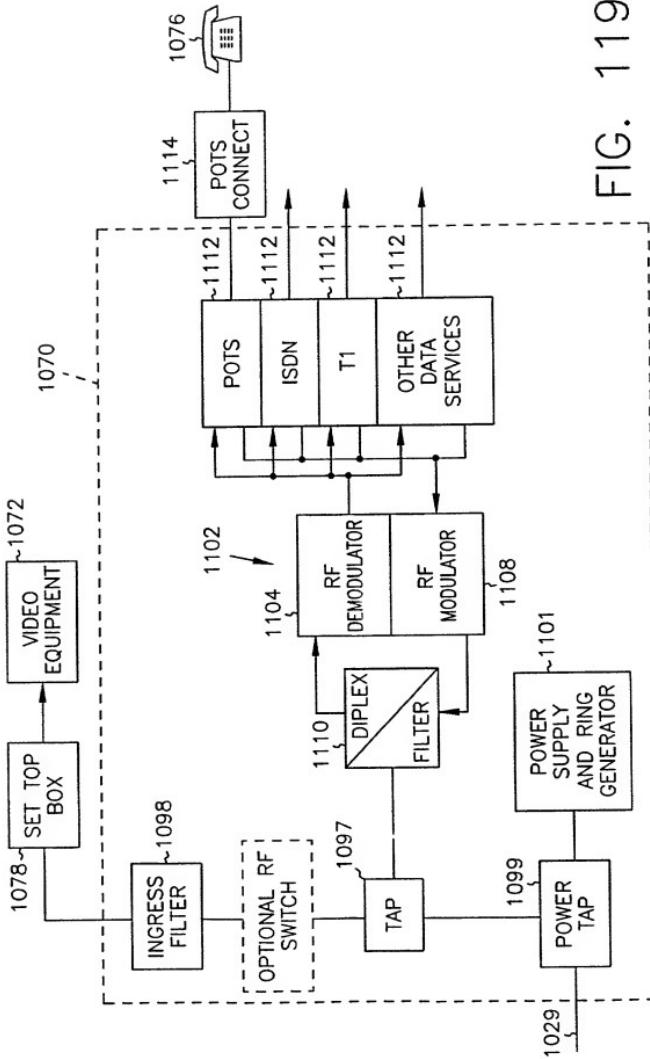


FIG. 119

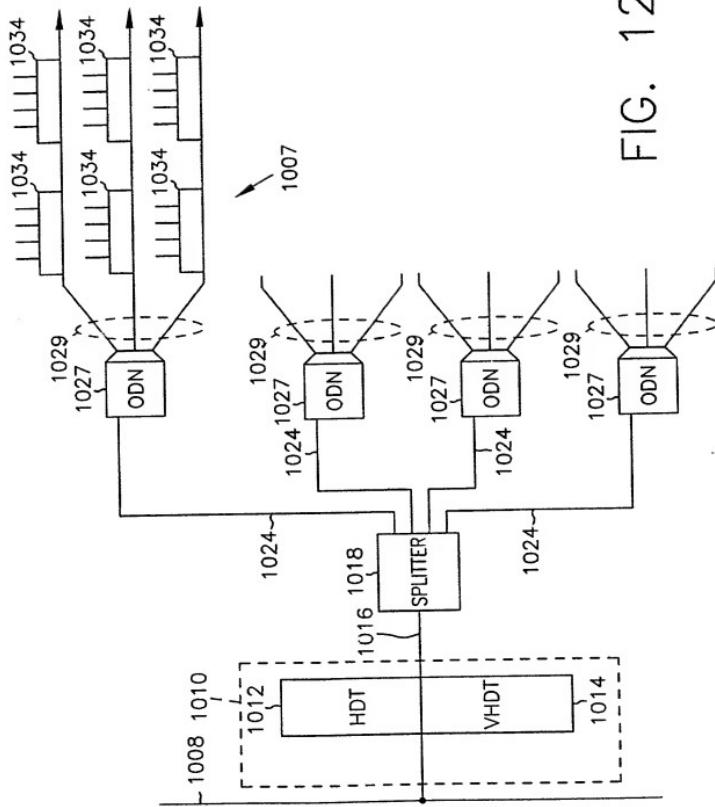


FIG. 120

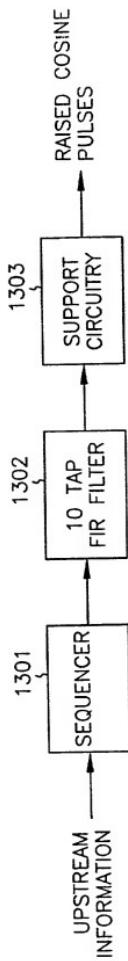


FIG. 121

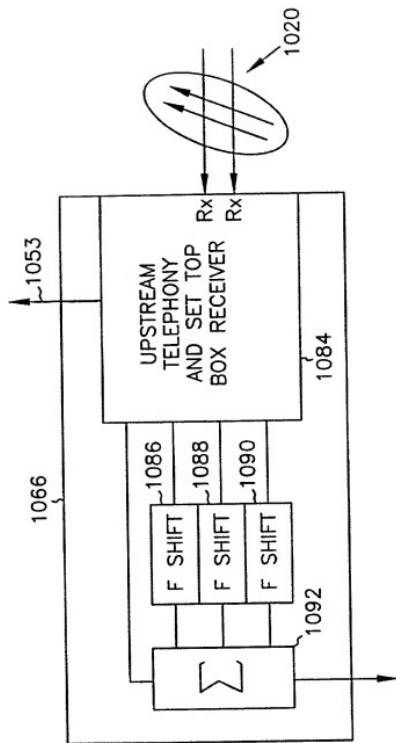


FIG. 122

